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A STUDY OF THE LACTARIAE OF THE UNITED STATES

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BY
GERTRUDE SIMMONS BURLINGHAM

ISSUED MAY 26, 1908

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GERTRUDE SIMMONS BURLINGHAM

CONTENTS

LIST OF ILLUSTRATIONS
INTRODUCTION
Scope and aim of the work 2
Collections of *Lactariae* in the New York Botanical Garden 2
Collections loaned for examination 2
Herbaria visited 3
Historical treatment of the genus 4
Arrangement of the genus in groups and sections 6
Distribution of species 6
Effect of latitude and elevation on distribution 7
Relation of humus to species distribution 8
Mycorhiza and *Lactariae* 8
Structure and internal morphology 8
Laticiferous vessels 9
Probable causes of the change in color of the latex 10
Chemical composition 11
Nomenclature 12
Color-scheme and photography 13
SYNOPSIS OF SECTIONS AND GROUPS 14
KEY TO KNOWN SPECIES OF LACTARIA IN THE UNITED STATES 15
KEYS TO INDIVIDUAL GROUPS AND DESCRIPTION OF SPECIES, INCLUDING SYNONYMS, DISTINGUISHING FIELD-MARKS, AND CRITICAL NOTES 18
INDEX 108

LIST OF ILLUSTRATIONS

(The photographs are all four fifths of the natural size of the plants)

Fig. 1. Lactaria glaucescens Crossl. 25
Fig. 2. Lactaria speciosa sp. nov. 35
Fig. 3. Lactaria crocea sp. nov. 38
Fig. 4. Lactaria delicata sp. nov. 39
Fig. 5. Lactaria agglutinata sp. nov. 41
Fig. 6. Lactaria lanuginosa sp. nov. 43
Fig. 7. Lactaria mucida sp. nov. 56
Fig. 8. Lactaria subpurpurea Peck 61
Fig. 9, 10. Lactaria minuscula Burl. 65
Fig. 11. Lactaria cinerea Peck 67
Fig. 12. Lactaria theiogala (Bull.) Fr. 70
Fig. 13. Lactaria Peckii sp. nov. 77
Fig. 14. Lactaria grisea Peck 80
Fig. 15. Lactaria isabellina Burl. 103

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INTRODUCTION

SCOPE AND AIM OF THE WORK

This study of the *Lactariae* has been limited to the United States, since, with the exception of a list of thirteen species from Nova Scotia,* and a few species from other provinces of Canada preserved in the herbarium of the N. Y. State Museum at Albany, no species have been reported from other parts of North America. In pursuance of the study the aim has been to observe the living plants in the field. Accordingly, for several summers, collections were made in the vicinity of Lake Ontario in Oswego County, New York. One season was spent in southern Vermont near Newfane, and in the summer of 1907 a study of the southern distribution of the genus was undertaken in the mountains of North Carolina about forty miles south of Asheville in the Pisgah Forest reserve, where the Biltmore Forest School is located during the summer.

The field study has been supplemented by the examination of dried specimens collected in various states, many of which collections are the property of the N. Y. Botanical Garden. Among these should be mentioned the herbarium of the late Professor L. M. Underwood, which contains species from Connecticut, Central New York, Indiana, and Alabama; the Earle collection from Connecticut, Alabama, Mississippi, and southeastern New York; the *Lactaria* herbarium of N. M. Glatfelter, including the specimens from which the determinations were made for his St. Louis list † as well as several species from Pennsylvania; specimens collected on Mt. Desert Island, Maine, by Miss V. S. White; species from Massachusetts collected by G. Morris; collections made in Maine, Pennsylvania, District of Columbia, Virginia, and Tennessee, by W. A. Murrill; some Delaware species collected by H. S. Jackson; collections made near Gainesville, Florida, by H. S. Fawcett; and specimens collected in Indiana, by G. W. Wilson. Several other collections were loaned to the Botanical Garden, thus facilitating the work very much. B. M. Longyear sent for

* MacKay, A. H. Fungi of Nova Scotia: a provisional list. Proc. and Trans. N. S. Inst. Sci. 11: 122–143. 1904.

† Preliminary list of higher fungi collected in the vicinity of St. Louis, Mo., from 1898 to 1905. Trans. Acad. Sci. St. Louis 16: 33–94. 1906.

examination the type specimens of his two Michigan species, while Kauffman sent his collection of *Lactariae* from Michigan. Through the courtesy of Dr. Bessey, I was enabled to examine the type of *L. villosus* Clements. Professor L. R. Jones kindly loaned the specimens of *Lactariae* in the herbarium of the University of Vermont, and Hanmer allowed me the privilege of examining his entire collection of *Lactariae* from Connecticut, including the specimens from which the determinations were made in the White list.*

Through the courtesy of Professor Peck, I was greatly assisted in examining the herbarium of the N. Y. State Museum at Albany. In addition to the New York specimens it includes species from several other states. Here are found the Peck type specimens. Professor Peck also furnished me with additional notes upon some of these, as will appear under the species. I found that in the Schweinitz herbarium, which is at the Academy of Natural Sciences of Philadelphia, not a specimen of *Lactaria* remains. The Herbst collection of fungi from near Allentown, Pennsylvania, has recently been turned over to the Academy of Natural Sciences of Philadelphia, and, although it has not yet been systematically arranged, I was able with the assistance of Mr. Stewardson Brown to pick out the *Lactariae* which it contains. Only three specimens given in his list are represented, but there are four in the collection which are not listed. The Frost collection of fungi is now accessible at the University of Vermont, at Burlington. It contains in good condition specimens of *L. hygrophoroides* B. & C., *L. scrobiculata* (Scop.) Fr., *L. insulsa* Fr., and *L. pergamena* (Swartz) Fr.; in poor condition, *L. trivialis* Fr. and *L. theiogala* (Bull.) Fr.; also, four species indicated as new, one with a brief description. The last are so covered with mold, however, as to conceal the specific characteristics.

Unfortunately, the specimens from which the determinations were made in the lists of *Lactariae* from some of the western states have not been preserved. This is true of Bundy's Wisconsin list of fungi,† Johnson's Mycological Flora of Minnesota,‡ the

* White, E. A. A preliminary report on the Hymeniales of Connecticut. Conn. Geol. and Nat. Hist. Surv. Bull. 3: 1–81. 1905.

† Geol. of Wis. Surv. 1: 396–401. 1883.

‡ Bull. Minn. Acad. Nat. Sci. 1876: 254–257. 1877.

Pacific Coast Fungi by Harkness and Moore, * and Morgan's treatment of *Lactarius* in his Mycologic Flora of the Miami Valley, Ohio.† The specimens reported from Maryland by Miss Banning are so perfectly reproduced in her Folio of Maryland Fungi, which is in the State Museum at Albany, N. Y., that there is no doubt as to the species which she had in hand, and I have not hesitated to accept her list. With this exception, the distribution of species as given in this paper has been based upon the examination of the specimens themselves.

HISTORICAL

The genus *Lactaria* was established by Persoon in 1797.‡ He defines the genus as follows: "Pileus fleshy, depressed, lamellae latex-bearing. If the pileus is broken and the lamellae a little irritated, they pour out a milky liquor for the most part acrid, in which respect these fungi agree with some higher plants; and this gives me a handle so that I am able to separate them under a peculiar genus from other agarics," etc. Under the genus he describes six species, four of which are readily assigned; namely, *L. piperata* (L.) Pers., *L. lateritia* Pers. [= *L. deliciosa* (L.) Fr.], *L. pallida* Pers., *L. torminosa* (Schaeff.) Pers.; of these, *L. piperata* (L.) Pers. stands as the type of the genus by reason of precedence. In his later books, Persoon returns to his earlier nomenclature, *Agaricus lactifluus* being used as equivalent to *Lactaria*, the species being written trinomially; nevertheless, to him belongs the credit of first recognizing the genus. Roussel § in 1806 used *Lactifluus* as a generic name. Regardless of these two attempts at separating the group as a genus, Fries classified the *Lactariae* under *Agaricus* both in the Observationes Mycologicae and in the Systema Mycologicum, in the latter of which he introduced the tribal name *Galorrheus.*‖ In the Epicrisis,¶ published in 1838, however, he took up the generic name *Lactarius*, the name by which the genus was henceforth designated until Schröter recognized the *Lactaria* of Persoon in his treatment of the genus in Cohn's Kryptogamen-Flora von

* Cat. Pacif. Coast Fungi 9. 1880.

† Jour. Cincinnati Soc. Nat. Hist. 6: 182–185. 1883.

‡ Tentamen dispositionis methodicae fungorum 63–65. 1797.

§ Flore du Calvados 66. 1806.

‖ Syst. Myc. 1: 61. 1821.

¶ Epicr. 333. 1838.

Schlesien. * And Hennings has followed Schröter in his treatment of the genus in the Engler & Prantl, Natürlichen Pflanzenfamilien.

Schröter has separated **Lactaria plinthogala** (Otto) † and *Lactaria ligniota* Fr. under the generic name *Lactariella* ‡ upon the basis of the yellow spores. But if the spore color is taken as a generic character, one must include other yellow-spored *Lactariae*, namely *L. deliciosa*, *L. subpurpurea*, and related species, as well as *L. delicata*, *L. crocea*, and *L. trivialis*, which are widely divergent from *L. plinthogala* and *L. ligniota*. Furthermore, *L. Gerardii*, a white-spored species, is so closely related to these two species as to suggest an origin from them. Hennings, also, has described one latex-bearing species from Africa under the generic name *Lactariopsis*, § the distinctive characteristic being the presence of a membranaceous veil connecting the stem with the pileus. After a careful study of the morphological and physiological characters of the species forming the genus *Lactaria* as it now stands, I have come to the conclusion that with the exception of the tribe *Pleuropus* Fr., which is not represented in America, there is not sufficient differentiation to form the basis of separation into smaller genera. The morphological characters which might serve as generic traits are neither constant enough in any group nor sufficiently limited to the one group. Taking for example the tomentose margin, we find it combined with a viscid pileus in *L. torminosa* (Schaeff.) Pers., and with a dry pileus in *L. deceptiva* Peck; while, if *L. regalis* Peck shall prove to be a valid species or only a form of *L. resima* Fr., it will give us in either case two physiologically and naturally related plants, one with tomentose, the other with glabrous margin. Again, among the species classified by Fries under the *Piperati*, we find glabrous forms like *L. piperata* (L.) Fr., and tomentose ones like *L. vellerea* Fr., yet there is no doubt but that these two are very closely related. In every group except the *Piperatae* there are species showing a deepening color in the mature gills, together with more or less pruinosity. The homogeneity of the genus is,

* 3: 534. 1889.

† *Agaricus plinthogalus* Otto, Versuch Agar. 75. 1816.
Agaricus fuliginosus Fr. Syst. Myc. 1: 73. 1821.
Lactarius fuliginosus Fr. Epicr. 348. 1838.

‡ Krypt.-Fl. Schles. 3: 544. 1889.

§ Bot. Jahrb. 30: 51. 1901.

then, very strong, and the most pronounced differences are physiological and are lost in the dried specimens.

In the present paper I propose to arrange the species of the genus in seventeen natural groups, each group being centered about a species which, by reason of possessing in a marked degree the characteristics found in the other species, shall stand as the type of the group. In many instances, the first described species has been found to combine the most of these characteristics. In speaking of this as a natural arrangement, I mean that each group is made up of those species which seem to be most closely related both morphologically and physiologically, and often so closely resemble each other as to be confused by the casual observer. In many groups the relationship is so marked that it is easy to conceive of the species as mutants from the type. It is a grouping which deals primarily with the living plants.

These groups I have in turn segregated into five sections: *Piperites*, *Sublimacina*, *Limacina*, *Russularia*, and *Dapetes*. Each of the last two embraces the species included by Fries in his so-called "tribe"* of the same name. On the other hand, the species which he included under the "tribe" *Piperites*, I have classified in three sections of equal rank with *Dapetes* and *Russularia*. The section *Sublimacina* is made up of species possessing characteristics of both the *Piperites* and the *Limacina*. It is not intended that this grouping shall multiply the names to be used in classification, but that it shall be an aid in the determination of species and in the comprehension of relationship.

THE DISTRIBUTION OF THE LACTARIAE IN THE UNITED STATES AND THE RELATION OF DISTRIBUTION TO LATITUDE, ELEVATION, AND FOREST CONDITIONS

Some *Lactariae* have been reported from all of the states east of the Mississippi River excepting Illinois and Kentucky. In the region west of the Mississippi, fourteen species have been reported from Missouri, three from Kansas,† two from Colorado, one from Nebraska, and ten from California.† This apparently limited dis-

* According to our present conception of the term *tribe*, Fries used it incorrectly. He applied the name to each of the four groups into which he divided the genus, namely: *Piperites*, *Dapetes*, *Russularia*, and *Pleuropus*. Hym. Eur. 422–439. 1821.

† I have seen only one specimen from Kansas and only a few from California.

tribution of the genus in the West is explained by the fact that in some of the western states no collections of fleshy fungi have been made. But enough has been done to indicate that some species will be found in any state, wherever the forest conditions are favorable.

Within the limits of the United States, latitude seems to affect the distribution of *Lactariae* chiefly in so far as it controls the character of the forest. *Lactaria Indigo* Schw., which grows in pine woods, has been found from Florida to the Adirondack region. *Lactaria deliciosa*, *L. subpurpurea*, and *L. atroviridis* have a like distribution. Out of thirty-one species which I found in North Carolina, twenty-three occur as far north as Vermont, one has a northern distribution in Europe, *L. Peckii* has been found as far north as Long Island, and six others have not been described before. *L. salmonea* Peck, from Alabama, and *L. subvellerea* Peck, have not as yet been found north of North Carolina.

Elevation also influences the distribution of species in proportion as it produces different ecological conditions. At 500 meters in Vermont, where the oaks are practically lacking, *L. piperata* (L.) Fr. and *L. lactiflua* L. rarely occur, while at 1,000 to 1,200 meters in North Carolina, where oaks and chestnuts form about 70 per cent. of the forest, these species are very abundant, but they disappear as one approaches the spruce line. At this altitude one begins to notice the combined effects of latitude and elevation. The condition of spruce forests in the southern states differs from that in the North. The greater elevation of the dividing line between oaks and spruces causes a greater daily range of temperature and the nights may be too cold for certain spruce-loving species. On this account it is probable that a species like *L. resima* Fr. will be found to be limited to northern forests. In the southern mountains below the spruce line, on account of the great humidity there will be not only a profusion of fungi but one might expect to find certain species which would thrive only under such moisture conditions. It is also possible that the unglaciated condition of the southern states may account for the occurrence of some species which seem to be limited to that region. This can not be stated with certainty until further field work proves that such species as *L. speciosa*, *L. agglutinata*, *L. salmonea*, etc., are not found north of the glacial line. Not enough is known about

the *Lactariae* in California and Oregon to form a basis for generalization.

The species of trees growing in a forest, then, seem to be the greatest factor in determining what species of *Lactaria* shall grow there. In oak or chestnut woods one may be sure of finding *L. lactiflua* L. and *L. piperata* (L.) Fr.; in beech woods, *L. cinerea* Peck and often *L. vellerea* Fr.; in hemlock woods, *L. deliciosa* (L.) Fr., *L. subpurpurea* Peck, and *L. deceptiva* Peck; other species seem to grow in any fairly moist deciduous forest. This limitation of species to the vicinity of a particular species of tree is undoubtedly largely due to the adaptation of the humus there found to the growth of the fungus. Bourquelot * claims to have found in *L. controversa* Fr., which grows at the foot of poplars, a ferment analogous to emulsin, which might indicate a symbiotic relation between the two. He was not able to find such a ferment in *L. vellerea* Fr. Noack † states that he found a mycorhiza relationship between *L. piperata* (L.) Fr. and *Fagus silvatica* and *Quercus pedunculata*, also between *L. vellerea* Fr. and the beech.

THE STRUCTURE, INTERNAL MORPHOLOGY, AND PHYSIOLOGY OF THE SPOROPHORE, INCLUDING COLOR CHANGES AND REACTIONS

The *Lactariae* and *Russulae* are characterized by a vesiculose structure, that is, by the presence of parenchyma-like cells scattered among the filamentous hyphae. Fayod ‡ designates these tissues as fundamental, consisting of isodiametric sphaerocysts, and connective tissue or slender hyphae. The sphaerocysts are grouped in the filamentous tissue, and DeBary § suggested that they might be enlarged branches of these hyphae constricted at rather regular intervals, so that the branch might be compared to a rosary. The sphaerocysts are sometimes grouped so as to appear in a cross-section of the stem like a rosette, the center of the rosette being the cross-section of a thin-walled tube which pur-

* Bourquelot, E. Présence d'un ferment analogue à l'émulsine dans les champignons et en particulier dans ceux qui sont parasites des arbres ou vivent sur le bois. Bull. Soc. Myc. Fr. **10**: 49–54. 1894.

† Ueber mykorhizenbildende Pilze. Bot. Zeit. **47**: 389. 1889.

‡ Ann. Sci. Nat. Bot. VII. **9**: 322–330. 1889.

§ Morph. Fung. Mycet. and Bact. 298–301. *f. 136.* 1887. [Engl. transl.]

sues a winding course through the fundamental tissue. The cortical tissue is made up of the filamentous hyphae and bands of this tissue run through the interior of the sporophore among the groups of sphaerocysts. There are also oil-vessels which Fayod * regards as derived from the connective tissue in a manner similar to the origin of the laticiferous vessels in the Papaveraceæ. In the *Lactariae* there is a well-developed system of latex-vessels, and it is the presence of these that distinguishes the genus *Lactaria* from the closely related genus *Russula*.

The latex-tubes are large thin-walled hyphae about 10–12 μ in diameter running through the bundles of connective tissue and sometimes approaching the groups of sphaerocysts but not coursing through this tissue. In the stem the tubes extend longitudinally and in the pileus they are for the most part parallel to the surface. They do not anastomose so as to form a network; but are connected now and then by short cross branches and in the trama they branch more freely. Fayod considers these latex-vessels to be modified sphaerocysts, since they sometimes end among the filamentous hyphae like sphaerocysts and since it is not uncommon to find these latter elongated and filled with granular colored protoplasm, as well as cylindrical with hyaline contents. He also regards the formation of the latex-vessels to be parallel with their formation in the higher plants.

According to Boudier† the latex is an emulsion of a resinous substance in a liquid which contains albuminoids, and it is this resinous product which gives to the latex its characteristic taste. Errera‡ states that the latex-tubes do not contain glycogen. The chemistry of this milky fluid has not, however, been sufficiently worked out. Errera advances the hypothesis that the fundamental tissue is the place for the deposit of hydrocarbon material while the filamentous hyphae are the routes along which the proteid material returns to the developing organs. Fayod § has also observed that glycogen is formed in the sphaerocysts and that the material nec-

* Cf. Godfrin, J. Homologie des hyphes vasculaires des agaricinés. Bull. Soc. Myc. Fr. **18**: 147–150. 1902.

† Boudier, E. Des champignons au point de vue de leurs caractères usuels chimiques et toxicologiques, 78–82. 1866.

‡ Sur le glycogène chez les Basidiomycètes 30, 31. 1885.

§ Fayod, *loc. cit.*

essary for the formation of the glycogen is carried through the filamentous hyphae and that later the nourishment returns along the same route to the hymenium as it is needed. Errera further suggests that the filamentous hyphae are elements of support. This can be true, of course, only in an elementary way.

The cause of the change in color of the latex of certain species of *Lactariae* has been somewhat recently studied by Bourquelot and Bertrand.* They came to the conclusion that the phenomena of coloration are often due to the presence of an oxidizing ferment in the cells which acts upon a particular chromogen contained in the mushroom. Only two out of twenty species examined showed the absence of an oxidizing ferment. These were *L. subdulcis* (Bull.) and *L. mitissima* Fr. When the latex changes color this chromogen is in solution in it and the oxidizing ferment concealed also in the solution acts upon the chromogen as soon as they come together in the air, as in the case of a wound, thereby changing the chromogen bodies into a colored pigment. It is to be assumed that in such species as *L. deliciosa* (L.) Fr. the mushroom is so rich in oxidizing substances that this color change will result in the outer layers of cells. This view is upheld by the fact that when a leaf adheres firmly to the surface the epidermis is frequently colorless. The latex in the *Dapetes* is either colored in the living plant or the change takes place so instantly when the flesh is broken that one cannot perceive it. If the color is present in the latex while within the plant, it is possible that the oxidizing ferments are able to use the oxygen which enters the plant by respiration. If this theory should be true we might expect variations of color under different temperatures and light conditions,† since these factors affect the respiration of the mushroom. But while it has been shown that light diminishes respiration, certain species are brighter-colored when growing in open woods. *L. theiogala*

*Bertrand, G. Bull. Soc. Chim. Paris III. **15**: 793. 1896.

Bourquelot, E. & Bertrand G. Les ferments oxydants dans les champignons. Bull. Soc. Myc. Fr. **12**: 18–26. 1896; Sur la coloration des tissus et du suc de certains champignons au contact de l'air. Bull. Soc. Myc. Fr. **12**: 27–32. 1896.

Bourquelot, E. Sur la présence générale, dans les champignons, d'un ferment oxydant agissant sur la tyrosine; sur le mécanisme de la coloration du chapeau de ces végétaux. Bull. Soc. Myc. Fr. **13**: 65–72. 1897.

† Bonnier & Mangin. Ann. Sci. Nat. Bot. VI. **17**: 210–302. 1884.

(Bull.) Fr. is nearly white when growing in dense shade but in a more exposed place it varies from yellowish-salmon to fulvous. In *L. lactiflua*, however, which varies greatly in color, I have not been able to detect any fixed relation between coloration and light. It is thus probable that color depends upon the interaction of a number of factors, and any one factor may not have the same effect upon color in two different species. In *Tricholoma Russula*, Bourquelot * was unable to find an oxidase ferment, yet color changes occur in the broken flesh, hence it seems possible that in some cases the action of the air alone is sufficient to cause a color change. Thus far, two oxidases have been identified in the mushrooms, tyrosinase and laccase, both of which occur in the *Lactariae*. No work has been done along this line upon the American species of *Lactaria*, and much investigation is needed before the chemistry and physiology of the genus will be understood.

The accompanying analysis of three species of *Lactariae* by Margewicz is taken from Schenck's Handbuch der Botanik (**4**: 391. 1890). The analysis was made from fresh young specimens. Bourquelot has made a study of the carbohydrates in several species of *Lactaria*. With the exception of *L. lactiflua* (L.), which contained volemite, mannite was present in all the species which he tested in the dried state. He found that the proportion of carbohydrate varies in different plants and in different specimens of the same species and that drying produces important differences both in the proportion and the nature of the substances. In *L. piperata* the trehalose disappears and is replaced by mannite. In other species the glucose which is present as a trace in the fresh plant is found in large proportions in the dried plant. Bourquelot's † analysis differs from that of Margewicz. From Gerard's ‡ studies of the oils in *L. vellerea* and *L. piperata*, we find that the former contains stearic acid, and the volatile acids, formic, acetic, and butyric, while oleic acid is present in a free state. Lecithine is probably present.

* Bull. Soc. Myc. Fr. **13**: 65–72. 1897.

† Bourquelot, E. Matières sucrées continues dans les champignons. Bull. Soc. Myc. Fr. **8**: 196–208. 1892; Les matières sucrées chez les lactaires. Bull. Soc. Myc. Fr. **5**: 143–163. 1889.

‡ Gerard, M. E. Sur les matières grasses de deux champignons. Bull. Soc. Myc. Fr. **6**: 115–128. 1890.

Analysis.	In fresh plant.		In the dry substance.						
	Solid.	Water.	Proteid.	Fat.	Mannite.	Sugar.	Ash.	Cellulose.	Waste.
L. torminosa	*P.* 10.17	89.83	39.14	5.34	13.14	1.98	7.37	28.93	4.10
	S. 8.82	91.18	26.37	4.01	15.71	4.31	5.27	38.86	5.47
L. piperata	*P.* 9.83	90.17	32.21	6.91	13.47	4.17	7.13	30.30	5.81
	S. 11.77	88.23	28.35	4.72	12.17	4.13	8.43	38.04	4.16
L. deliciosa	*P.* 10.01	89.99	38.12	7.37	12.91	1.49	8.14	27.42	4.55
	S. 8.90	91.10	27.00	4.20	11.57	5.27	8.48	39.27	4.21

P = pileus. *S* = stem.

ECONOMIC VALUE

So far as is known, none of the *Lactariae* are seriously poisonous, although some are considered somewhat poisonous, while a large number of the species are edible. Whenever the edible qualities are known, I have indicated it at the end of the description of the species, following, in every instance, the conservative opinion.

NOMENCLATURE

In the matter of nomenclature, I have followed the rules of the American Code.* According to this, under canon 16 (*c*), *Lactarius* Fr. is to be regarded as a homonym in the sense that it is a variation from *Lactaria* Pers. merely in the spelling of the word; so that while the latter form must be retained because of priority, the name *Lactarius* is considered as practically identical with it, and the transfer of a species from *Lactarius* Fr. to *Lactaria* Pers. is not to be looked upon as making new combinations. But in all cases I have attempted to show which form was used by the one describing the species, as well as to indicate any subsequent correction. For example, "*Lactaria pergamena* (Swartz) Fr. Epicr. 340. 1838 [as *Lactarius*]. — Schröt. in Cohn, Krypt.-Fl. Schles. **3**: 537. 1889," would be explained as follows: The species was described by Swartz under the specific name *pergamena*, transferred from *Agaricus* to *Lactaria* by Fries under the form *Lactarius pergamenus*, and later corrected by Schröter to read *Lactaria pergamena*.

* Bull. Torrey Club **34**: 167–178. 1907.

COLOR-SCHEME USED, AND EXPLANATION OF PHOTOGRAPHIC METHODS

In the description of the colors of the mushrooms, I have used the Répertoire de Couleurs published by the Société Française des Chrysanthémistes, which contains 365 color-plates, most of the colors being produced in four tones. The plates represent living rather than metallic colors and are for this reason admirably adapted to the use of the mycologist. In the description of species the numbers in parenthesis after the color refer to the plate and tone in the Répertoire.

For the accompanying plates perfectly fresh representative plants were photographed four-fifths natural size on orthochromatic plates.

The specimens photographed were all collected in the "Pink Beds" region, in the Pisgah Forest reserve, about forty miles south of Asheville, North Carolina.

Much of this work was completed under the direction of Professor L. M. Underwood, whose assistance and inspiring encouragement I am glad to acknowledge. Many thanks are due also to Professor F. S. Earle for reading the manuscript.

Order *AGARICALES*

Family **AGARICACEAE**

Genus LACTARIA

Sections, PIPERITES, SUBLIMACINA, LIMACINA, RUSSULARIA, AND DAPETES

Groups, 17, as in following synopsis of sections and groups, etc.

Synopsis of sections and groups

* Latex white at first (except in *L. salmonea* in XV)

α. PIPERITES. Gills becoming neither darker with age nor pruinose; latex usually very acrid.

Pileus without a pellicle, absolutely dry.

Color white. — I. PIPERATAE.

Color dark. — II. RUSTICANAE.

Pileus viscid when wet.

Margin involute, densely tomentose or villose. — III. TORMINOSAE.

β. SUBLIMACINA. Gills becoming somewhat deeper-colored with age and pruinose; pileus very viscid, margin involute and more or less downy-tomentose at first; latex less acrid than in α or γ.

Latex white, unchanging. — V. AGGLUTINATAE.

Latex becoming yellow. — IV. CROCEAE.

Latex or wounds becoming lilac. — VI. ASPIDEAE.

γ. LIMACINA. Gills unchanged with age or sometimes slightly darker in *Triviales* and slightly pruinose; pileus very viscid, margin absolutely naked; latex very acrid.

Pileus some shade of gray or brown or red. — VIII. TRIVIALES.

Pileus some shade of yellow. — VII. INSULSAE.

δ. RUSSULARIA. Gills decidedly darker when mature, and pruinose; latex mild or tardily acrid except in *L. rufa* and *L. chrysorhea*.

Pileus viscid when wet, never slimy, soon dry.

Latex not becoming yellow or red.

Pileus grayish. — XI. CINEREAE.

Pileus pale leather-colored to fawn or mahogany. — X. QUIETAE.

Latex becoming yellow. — XII. THEIOGALAE.

Pileus not viscid when wet.

Surface glabrous, polished, or sometimes areolate.

Flesh thin, stem slender. — XVII. CAMPHORATAE.

Flesh thick, firm, stem stout. — XVI. LACTIFLUAE.

Surface pruinose to velvety.

Color some shade of fulvous. — XVI. LACTIFLUAE.

Color white or some shade of brown. — XV. PLINTHOGALAE.

Surface minutely tomentose or squamulose.

Color some shade of gray. — XIV. GRISEAE.

Color testaceous to fulvous or isabelline. — XIII. HELVAE.

** Latex bright-colored from the first

ε. DAPETES. Pileus somewhat viscid when wet, spores yellowish, latex not very acrid; plants edible.

Wounds becoming greenish, at least after some time.	IX. DELICIOSAE.
Wounds not becoming greenish.	XV. *L. salmonea.*

Key to the known species of Lactaria in the United States*

Latex bright-colored from the first.	A
Latex white, unchanging.	B
Latex becoming yellow, at least where in contact with the flesh.	C
Latex becoming lilac, at least where in contact with the flesh.	D
Latex becoming salmon-colored, or reddish, at least where in contact with the flesh.	E
Latex becoming glaucous-green.	F

A

Latex bright-colored from the first

1. Pileus more or less zonate.	2
Pileus azonate, whitish, latex salmon-colored.	57. *L. salmonea.*
2. Latex indigo-blue or paler.	33. *L. Indigo.*
Latex dark-red.	32. *L. subpurpurea.*
Latex orange-colored, then red-orange.	30. *L. deliciosa.*
Latex saffron-yellow.	31. *L. Chelidonium.*

B

Latex white, unchanging

Pileus never viscid.	§ I
Pileus viscid when young or wet.	§ II

§ I

1. Latex very acrid.	2
Latex mild or tardily acrid.	11
2. Pileus white.	3
Pileus colored.	8
3. Surface glabrous.	4
Surface not glabrous.	6
4. Margin naked, plants large.	5
Margin silky, plants small.	7. *L. involuta.*
5. Flesh thin, gills becoming straw-colored, 1 mm. broad.	2. *L. pergamena.*
Flesh thick, gills dichotomously branching, 2 mm. broad.	1. *L. piperata.*
6. Surface velvety-tomentose.	7
Surface glabrous or torn, margin cottony-tomentose.	5. *L. deceptiva.*
7. Gills distant, broad.	3. *L. vellerea.*
Gills close, narrow, cinnamon-colored in drying.	4. *L. subvellerea.*
8. Pileus glabrous, at least when mature.	9
Pileus scabrous-hairy, olivaceous.	9. *L. atroviridis.*
9. Red.	10
Gray, mixed with brown, zonate, moist.	8. *L. rusticana.*
10. Umbonate.	44. *L. rufa.*

* In the keys preceding the groups will be found the doubtful American species and the European species which have been reported from the United States, but the occurrence of which is uncertain.

	Without umbo.	47. *L. rufula.*
11.	Pileus glabrous.	12
	Pileus squamulose to floccose-squamulose.	21
	Pileus velvety, or minutely tomentose.	26
12.	Gills not changing color where wounded.	13
	Gills changing color where wounded.	18
13.	Pileus fulvous to isabelline.	14
	Pileus putty-colored, stem and gills concolorous.	53. *L. Sumstinei.*
14.	Pileus zonate when moist.	69. *L. mutabilis.*
	Pileus azonate.	15
15.	Latex white or sometimes bluish-white to watery and thin.	16
	Latex whey-colored, pileus fading.	67. *L. seriflua.*
16.	Pileus polished, not fading.	17
	Pileus becoming areolate, fading, latex watery.	65. *L. rimosella.*
17.	Odor none.	66. *L. subdulcis.*
	Aromatic, stronger in drying.	64. *L. camphorata.*
18.	Gills becoming greenish where wounded.	19
	Gills becoming brown where wounded.	20
19.	Pileus about 3 cm. broad, umber-colored.	70. *L. parva.*
	Pileus up to 7.5 cm. broad, grayish, often roughened.	71. *L. varia.*
20.	Pileus azonate.	58. *L. lactiflua.*
	Pileus zonate.	60. *L. ichorata.*
21.	Pileus fulvous to isabelline.	22
	Pileus gray.	23
22.	Odor none, latex white.	46. *L. alpina.*
	Aromatic, latex watery.	43. *L. helva.*
23.	Odor none.	24
	Aromatic.	50. *L. glyciosma.*
24.	Pileus azonate, floccose-squamulose.	48. *L. grisea.*
	Pileus zonate.	25
25.	Plants very small, blue-black to slate-colored, stem glabrous.	49. *L. Bensleyae.*
	Plants larger, paler, stem pubescent.	51. *L. Hibbardae.*
26.	Pileus azonate.	27
	Pileus zonate, brick-red.	45. *L. Peckii.*
27.	Wounds becoming brown or fulvous.	28
	Wounds not changing color.	29
28.	Pileus yellowish-buff, gills close.	62. *L. luteola.*
	Pileus Vandyke-brown, corrugated.	61. *L. corrugis.*
29.	Pileus brown, gills distant.	55. *L. Gerardii.*
	Pileus golden-fulvous.	31
30.	Gills distant.	59. *L. hygrophoroides.*
	Gills close.	63. *L. subvelutina.*

§ II. Pileus viscid when young or wet

1.	Latex acrid.	2
	Latex mild or slowly acrid.	9
2.	Margin of pileus involute at first, with long tomentum.	3
	Margin of pileus involute at first, with tomentum about 1 mm. long, soon naked.	4
	Margin of pileus naked, pileus glabrous.	5
3.	Pileus whitish, entirely covered with matted tomentum, azonate.	11. *L. cilicioides.*
	Pileus yellowish, glabrous in the center, zonate.	10. *L. torminosa.*

4. Pileus white, zonate, sparsely covered with coarse tomentum. 18. *L. lanuginosa.*
Pileus buff, papillate when wet, squamulose when dry. 17. *L. agglutinata.*
Pileus olivaceous-umber. 19. *L. turpis.*
5. Pileus yellowish to orange. 6
Pileus gray. 7
Pileus red, azonate. 28. *L. hysgina.*
6. Zonate, spores yellowish. 24. *L. insulsa.*
Azonate, spores white. 25. *L. affinis.*
7. Wounds of the gills becoming glaucous-green. 8
Wounds not changing, pileus zoned with umber, fading. 27. *L. circellata.*
8. Pileus gray to putty-colored, sometimes lilac-tinted, spores yellow. 26. *L. trivialis.*
Pileus sepia, spores white. 29. *L. mucida.*
9. Pileus gray, gills not changing color where wounded. 39. *L. cinerea.*
Pileus red. 10
Pileus fulvous to pale-isabelline, plants small. 11
Pileus brownish, obscurely zonate, fading. 38. *L. paludinella.*
10. Flesh thick, pileus soon dry. 34. *L. quieta.*
Flesh thin, pileus shining-viscid when moist. 35. *L. nitida.*
11. Umbo persisting dark, latex mild. 36. *L. oculata.*
Umbo concolorous, margin crenate, milk acrid. 37. *L. minuscula.*

C

Latex becoming yellow, at least where in contact with the flesh

1. Margin of young pileus with long tomentum. 2
Margin of young pileus glabrous or minutely tomentose. 3
2. Pileus white. 13. *L. resima.*
Pileus yellowish, zonate, stem with bright pits. 12. *L. scrobiculata.*
3. Latex mild. 68. *L. isabellina.*
Latex slowly acrid or bitterish. 4
Latex acrid. 6
4. Pileus zonate, pinkish-buff to fulvous. 40. *L. theiogala.*
Pileus azonate. 5
5. Pileus whitish, not becoming perceptibly darker. 40. *L. theiogala.*
Pileus whitish, then reddish-brown. 41. *L. colorascens.*
6. Pileus umber-brown, subtomentose. 56. *L. subtomentosa.*
Pileus some shade of yellow, glabrous. 7
7. Pileus very viscid when moist. 8
Pileus scarcely viscid, pallid, zoned with yellow spots. 42. *L. chrysorhea.*
8. Pileus saffron-yellow, latex becoming yellow-cadmium. 15. *L. crocea.*
Pileus maize-yellow, salmon-tinted, latex becoming sulphur-yellow. 16. *L. delicata.*

D

Latex becoming lilac or heliotrope, at least where in contact with the flesh

1. Pileus covered with long tomentum, zonate. 14. *L. speciosa.*
Pileus glabrous. 2
2. Gray. 3
Yellow. 4
3. Azonate or faintly zoned, stem not spotted. 22. *L. lividorubescens.*
Conspicuously zoned, stem spotted, plants large. 23. *L. maculata.*

4. Straw-colored, azonate, latex acrid. 20. *L. aspidea.*
Sulphur-yellow, zonate, latex bitter. 21. *L. aspideoides.*

E

Latex becoming salmon or reddish, at least where in contact with the flesh

1. Pileus glabrous, not spotted or zoned. 52. *L. plinthogala.*
Pileus velvety, seal-brown. 54. *L. ligniota.*

F

Latex becoming glaucous-green *

1. Pileus white, dry, latex very acrid. 6. *L. glaucescens.*

DESCRIPTIONS OF THE SPECIES, INCLUDING KEYS, ARRANGED BY GROUPS

1. PIPERATAE

Pileus without a pellicle and absolutely dry, glabrous or tomentose, flesh firm; plants for the most part large; gills not becoming darker with age nor pruinose; latex very acrid, white, unchanging except in *Lactaria glaucescens*, in which it dries glaucous-green.

In one species, *Lactaria deceptiva*, the margin is very involute, and is covered with a roll of tangled fine cottony tomentum as in the *Torminosae.*

Synopsis of species

Latex white, unchanging.
Plants large.
Pileus glabrous.
Pileus thin; gills very close, about 1 mm. broad. 2. *L. pergamena.*
Pileus thick; gills dichotomously forking, 2 mm. broad. 1. *L. piperata.*
Pileus velvety-tomentose.
Gills distant. 3. *L. vellerea.*
Gills close. 4. *L. subvellerea.*
Pileus with a cottony roll on margin, surface glabrous or torn. 5. *L. deceptiva.*
Plants small, pileus up to 5 cm. broad; margin involute, minutely silky. 7. *L. involuta.*
Latex drying glaucous on broken flesh and gills. 6. *L. glaucescens.*

1. LACTARIA PIPERATA (L.) Pers. Tent. Disp. Meth. Fung. 64. 1797

Agaricus piperatus L. Sp. Pl. 1173. 1753; Fl. Suec. 373. 1745.
Not *Agaricus piperatus* α and β, L. Fl. Suec. 441. 1755.
Agaricus Listeri Withering, Nat. Arr. Brit. Pl. 4: 156. 1801. [Ed. 4.]

* See also B § I, 19, and B § II, 9.

Pileus fleshy, compact, convex-umbilicate, at length infundibuliform, white, azonate, dry, glabrous, 4–12 cm. or more in diameter, margin involute at first and naked, at length uplifted; gills white or creamy-white, forking dichotomously, close, more or less decurrent, arcuate at first, then extending upwards, only about 2 mm. broad; stem white, equal, dry, often pruinose, solid and firm, 2–8 cm. long, up to 2 cm. thick, flesh white, unchanging or becoming sordid; spores white, subglobose, nearly smooth, 8–9 μ; latex white, unchanging, very acrid, abundant. *Edible.*

HAB.: In oak woods or groves. July to October.

DISTRIB.: New York, *Peck, Earle, Burlingham 20,* 1905; Connecticut, *Underwood;* New Jersey, *Sterling;* Pennsylvania, *Mrs. Dallas;* Maryland, *Banning;* District of Columbia, *Murrill, 1403;* Virginia, 600 meters elevation, *Murrill 272* and *371;* North Carolina, *Burlingham;* South Carolina, *Ravenel;* Tennessee, 500 meters elevation, *Murrill 517 B;* Alabama, *Underwood;* Indiana, *G. W. Wilson;* Missouri, *Glatfelter 345.* It has also been reported from the following states: Maine (White); Vermont (Frost); Rhode Island (Bennett); Ohio (Morgan); Minnesota (Johnson); Wisconsin (Bundy); California (Harkness & Moore).

ILLUST.: Atkinson, Stud. Am. Fungi, *f. 119;* Banning, Folio Md. Fungi, *pl. 83;* Barla, Champ. Nice, *pl. 22. f. 1–5;* Bel. Champ. Tarn. *pl. 22;* Bern. Champ. Roch. *pl. 37. f. 2;* Bolt. Geschichte, *pl. 21;* Boyer, Champ. Comest. et Vén. Fr. *pl. 30;* Britz. Lact. *f. 24;* Bull. Herb. Fr. *pl. 200, Agaricus acris;* Cooke, Br. Fungi, *pl. 979;* Cordier, Champ. Fr. *pl. 28. f. 1;* Eng. & Prantl, Nat. Pflanzenfam. 1^{1}**: *f. 110B;* Fl. Dan. *pl. 1132;* Fries, Sverig. Svamp. *pl. 27;* Hahn, Der Pilz-Sammler, *f. 18,* ed. 2; Harzer, Pilze, *pl. 39;* Krombh. Abbild. *pl. 56. f. 1–4;* Lanzi, Fung. Mang. *pl. 54. f. 2 a, b, c;* Lorinser, Essb. und Gift. Schwäm. *pl. 9. f. 4;* McIlvaine, One Thous. Am. Fungi, *pl. 41. f. 1.;* Pat. Tab. Analyt. Fung. *pl. 119;* Paulet, Traité Champ. *pl. 68. f. 3–4;* Roumeg. Crypt. Illustr. *f. 144;* Rich. & Roze, Atl. Champ. *pl. 40. f. 5–8;* Schaeff. Fung. Bav. Icon. *pl. 83, Agaricus amarus;* Sicard, Hist. Nat. Champ. *pl. 44. f. 235;* White, Conn. Geol. and Nat. Hist. Surv. Bull. 3: *pl. 9.*

EXSIC.: Ravenel, Fungi Caroliniani, fasc. 2, *5 p. p.*; Roumeguère, Fungi Gallici *3819.*

DISTINGUISHING FIELD-MARKS: The glabrous, white pileus, the

close, dichotomously forking, rather narrow gills, and the thick flesh. Usually the latex remains entirely white, and the flesh is odorless.

In North Carolina I found plants agreeing in all other essentials with *Lactaria piperata* except that the latex dried a pale-yellowish, and the fresh plant when wet or when rubbed had the odor of crushed blackberries, and the gills were slightly less crowded. This can scarcely represent more than a form of the species and on account of the odor, which is the distinguishing characteristic, I will refer to it as form **fragrans.** It is *no. 79*, 1907, of my North Carolina plants. Gillet recognizes a form *amara*, in which the milk becomes yellowish in drying, but the plant is odorless.

In *Species Plantarum* 1173. 1753, Linnaeus gives as synonyms of his *piperatus* the following: *Amanita piperata alba*, Dill. Giss. 179; *Fungus piperatus albus acris*, Mich. Gen. 141; Haller, 34. n. 1; and *Fungus albus acris*, C. Bauhin 371. No mention was made by any of these writers of incarnate gills, Micheli describing his *piperatus* under *unicolores albi*, and Haller under gills white. Since the *piperati* referred to by Linnaeus are all described as white, and no mention is made of zones or tomentose covering, this character of the gills seems scarcely sufficient evidence to indicate that Linnaeus had in mind *Agaricus piperatus* var. *α* and *β*, Fl. Suec. 441. 1755, when he described *Agaricus piperatus* in Fl. Suec. 373. 1745, and Sp. Pl. 1173. 1753. If it were shown that the *Agaricus piperatus* L. Sp. Pl. 1173. 1753, were the same as *Agaricus piperatus* L. Fl. Suec. 441. 1755, var. *α* and *β*, then *Lactaria torminosa* (Schaeff.) Pers. would be the real *Lactaria piperata* and *Lactaria torminosa* would be reduced to a synonym. For, according to the present codes, *Agaricus piperatus* must be credited to Linnaeus whatever the type may prove to be, so there is no ground for crediting Scopoli with the name, and, furthermore, Scopoli gives *Agaricus piperatus* Sp. Pl. 1173 and Fl. Suec. 441. 1755 as synonyms of his own *piperatus*.

In conclusion, it seems most probable that the forms included under var. *α* and *β*, Fl. Suec. 441. 1755, were found later by Linnaeus and incorrectly referred by him to *Agaricus piperatus* as described in Sp. Pl. 1173. 1753, which was undoubtedly the esculent *fungus piperatus* of the ancient writers and the German "*Pfefferling*."

2. LACTARIA PERGAMENA (Swartz) Fr. Epicr. 340. 1838. [As *Lactarius.*]—Schröt. in Cohn, Krypt.-Fl. Schles. **3**: 537. 1889

Agaricus pergamenus Swartz, Kongl. Sv. Vet.-Akad. Nya Handl. **30**: 90. 1809.

Pileus fleshy, pliant, thin, convex to plane or depressed, often irregular and eccentric, and usually flexuous, white to creamy-white when old, azonate, dry, glabrous, minutely wrinkled, 4–11 cm. broad; gills white, then straw-colored, very close, thin, forking, adnate, horizontal, very narrow (1 mm. broad); stem white, equal or tapering downwards, glabrous, smooth, stuffed, but firm; spores white, minutely echinulate, elliptical, 8 × 6 μ; flesh white; latex white, abundant, acrid. *Edible.*

HAB.: In dry oak woods. August, September.

DISTRIB.: New York, *Peck*, *Burlingham* (120 meters elevation); Vermont, *Frost;* Connecticut, *Earle;* Virginia, *Murrill;* North Carolina, 1,000 meters elevation, *Burlingham 39*, 1907; Alabama, *Earle;* Ohio, *Morgan*, *Dawson;* Tennessee, 500 meters elevation, *Murrill 517;* Mississippi, *Earle.*

ILLUST.: Batsch, Elench. Fung. *pl. 13. f. 59, a, b, c. Agaricus piperatus;* Britz. Lact. *f. 10;* Cooke, Br. Fungi, *pl. 978;* Gillet, Champ. Fr. *pl. 152* [*389*]*; Krombh. Abbild. *pl. 57. f. 1–6;* Lucand, Champ. Fr. *pl. 42.*

DISTINGUISHING FIELD-MARKS: This species is very closely related to *Lactaria piperata*, and is often confused with it. According to Fries it differs from *Lactaria piperata* in having a stuffed stem which at length becomes spongy, and is longer, tapers downwards, and is perfectly glabrous; in the thinner, pliant, elastic, often irregular and eccentric, and for the most part, flexuous pileus, which is at first convex and not umbilicate, then rather plane, and wrinkled in a peculiar manner; in the gills being adnate, very close and very narrow, always straight and plane, and soon becoming straw-colored. The latex is more abundant in the flesh than in the gills.

Lactaria pergamena is not so common as *Lactaria piperata.* The latex sometimes dries sulphury-white (*14. t. 2*).

* The plates in Gillet's Champ. Fr. were renumbered in 1890 and again in the final edition. In citation I have given the original number and in brackets the numbers which occur in the subsequent revisions.

3. LACTARIA VELLEREA (Fr.) Fr. Epicr. 340. 1838.
[As *Lactarius.*]. — Schröt. in Cohn, Krypt.-Fl. Schles. **3**: 538. 1889

Agaricus vellereus Fr. Syst. Myc. **1**: 76. 1821.

Pileus fleshy, thick, firm, convex-umbilicate, with inrolled, then extended margin, depressed in the center, whitish, tinged in places with grayish or yellowish, dry, minutely tomentose, 6–11 cm. broad; gills whitish, becoming cream-colored or yellowish, changing to brownish with injury, many forking near the stem, interveined, shorter gills often joining with longer, distant, appearing more so with age or in larger specimens, adnate to slightly decurrent, 2–5 mm. broad; stem whitish, tinged in places with yellow, equal or rounded at the base, pruinose-velvety, 3–4 cm. long, 18–25 mm. thick; flesh white at first, staining yellowish; spores white, globose to ovate or elliptical, with only a few scattering blunt spines, uniguttulate, 5–6 μ × 8 μ; latex white, acrid, unchanging, or if creamy soon becoming white again. Regarded as poisonous by some.

HAB.: Open deciduous woods. July, August, September.

DISTRIB.: New York, *Peck*, *Earle*, *Burlingham*, *Peck & Earle* (Long Island); Vermont, *Burlingham 49*, 1906; Maine, *White;* Connecticut, *Underwood*, *Hanmer 153;* New Jersey, *Earle;* Virginia, *Murrill 135;* North Carolina, 1000–1200 meters elevation, *Burlingham 101*, 1907; Tennessee, 300 meters elevation, *Murrill. 526;* South Carolina, *Ravenel;* Alabama, *Earle.*

ILLUST.: Barla, Champ. Nice, *pl. 22. f. 6–8;* Bres. Fung. Mang. *pl. 67;* Britz. Lact. *f. 26;* Bull. Herb. Fr. *pl. 538. f. G, H, N;* Cooke, Br. Fungi, *pl. 980;* Cordier, Champ. Fr. *pl. 28. f. 2;* Gillet, Champ. Fr. *pl. 153* [*400*]; Hahn, Der Pilz-Sammler, ed. 2. *pl. 4. f. 17;* Hussey, Illust. Br. Myc. **1**: *pl. 63;* Klotzsch, in Dietrich, Fl. Bor. *pl. 469;* Krombh. Abbild. *pl. 57. f. 10–13;* Lanzi, Fung. Mang. *pl. 54. f. 1;* Lorinser, Essb. und Gift. Schwäm. *pl. 9. f. 5;* Phoebus, Deutschl. Krypt. Giftgewächse, *pl. 4. f. 3, 4;* Rich. & Rose, Atl. Champ. *pl. 3a. f. 1–3;* Sicard, Hist. Nat. Champ. *pl. 45. f. 239;* Sowerby, Eng. Fungi, *pl. 104*, *Agaricus Listeri;* White, Conn. Geol. and Nat. Hist. Surv. Bull. **3**: *pl. 9.*

EXSIC.: * Ravenel, Fungi Caroliniani, fasc. 2, *5 p. p.;* Roumeguère, Fungi Gallici *3819.*

* In the Fungi Caroliniani Exsic. of Ravenel, fasc. 2, *no. 5* in the herbarium of the N. Y. Botanical Garden, there are two specimens of *L. vellerea* Fr. on the sheet with *L. piperata* (L.) Fr.

DISTINGUISHING FIELD-MARKS: *Lactaria vellerea* may be distinguished from *Lactaria piperata* (L.) Fr. by the short tomentum on the pileus. In typical forms this is dense and gives the surface a very velvety feeling, but it is sometimes less prominent. The gills also differ in being distant and they stain brownish where wounded, while the milk dries in gummy drops on the gills. The gills do not for the most part fork dichotomously as in *Lactaria piperata*, but the shorter ones anastomose with the longer ones. While the latex is practically unchangeable, it is noted by Earle as becoming cream-colored (herb. N. Y. Bot. Garden *789, 846*, 1906). Massee says the latex sometimes becomes pale-sulphur when the flesh is broken but soon changes to white.

Up to the time of Fries, this mushroom was confused with so-called *piperatus* forms. *Agaricus piperatus* described by Pollich (Fl. Pal. **3**: 289) in 1777, is very clearly *L. vellerea* of Fries. This is the only description prior to Fries which makes mention of the tomentose covering of the pileus. Sowerby figures it in 1797, then considering it to be the same as the mushroom described by Dr. Lister (Ray Cat. Plant. 123. 1677). Bulliard's *Agaricus acris pl. 538. f. G, H, N*, is undoubtedly *L. vellerea* Fr.

4. LACTARIA SUBVELLEREA Peck, Bull. Torrey Club **25**: 369. 1898. [As *Lactarius*]

Pileus fleshy, thin, convex, soon umbilicate, at length nearly infundibuliform, white, becoming tinged or spotted with yellowish, and when dried cinnamon-colored (*323. t. 1–4*), azonate, dry, covered with velvet-like tomentum, 7.5–15 cm. broad, margin at first and for some time very involute, at length spreading; gills white to pale cream-colored, staining amber-white (*12. t. 4*) where the latex dries, often forking, adnate or slightly decurrent, narrow; stem white, tapering slightly toward the base, dry, velvety-pubescent, firm, 1.8–2.8 cm. long, 1.2–2.5 cm. thick; flesh amber-white, odor faint; spores subglobose, smooth, 6–6. 5 μ × 6.5–7.5 μ, latex pale cream-colored or whitish, very acrid, usually abundant.

HAB.: On dry ground, mixed woods. July.

DISTRIB.: Alabama, *Earle* (type); North Carolina, *Burlingham 7*, 1907.

DISTINGUISHING FIELD-MARKS: This species differs from *L. vellerea*, to which it is closely related, in the narrow close gills, and in the finer velvety tomentum or pubescence covering the

pileus and the stem. The latex is cream-colored or dries yellowish on the gills. The change in color of the pileus and stem during drying is a marked characteristic.

The type specimens are in the herbarium of the N. Y. Botanical Garden. The specimen which I found in North Carolina has the gills a little more distant, but otherwise appears like the type. It occurred in oak-chestnut woods at an elevation of 1000 meters.

5. LACTARIA DECEPTIVA Peck, Ann. Rep. N. Y. St. Bot. **38**: 125. 1885. [As *Lactarius.*] — Hennings, in Eng. & Prantl, Nat. Pflanzenfam. **1**[1] * * : 216. 1898.

Pileus fleshy, firm, convex-umbilicate, then expanded and centrally depressed or somewhat infundibuliform, white or whitish, dry, glabrous at first, becoming torn into fibers and cracked as the pileus matures, 5–15 cm. broad, margin involute at first and covered with a dense soft cottony tomentum which fills in the space between the margin and the stem, then spreading or elevated and more or less fibrillose; gills whitish or cream-colored, some forking, somewhat distant, adnate or decurrent, rather broad; stem white, nearly equal, pruinose-pubescent, solid, 2–8 cm. long, 10–40 mm. thick; flesh white; spores white, globose to elliptical, echinulate, 8–9 μ × 9–12 μ; latex white, unchanging, acrid. *Edible.*

HAB.: On the ground in woods, especially near hemlock trees, rarely in oak-chestnut woods. July, August, and September.

DISTRIB.: New York, *Peck, Shear, Jackson, Burlingham;* Maine, *White;* Vermont, *Burlingham 21*, 1906; Massachusetts, *Vail;* Connecticut, *Underwood & Earle, Hanmer 682;* Pennsylvania, *Herbst;* Virginia, *Murrill 80;* North Carolina, 1000 to 1675 meters elevation, *Burlingham 56*, 1907; Alabama, *Earle;* Ontario, *Guillet.*

ILLUST.: Atkinson, Stud. Am. Fungi, *f. 120, 121, Lactarius resimus;* White, Conn. Geol. and Nat. Hist. Surv. Bull. **3**: *pl. 8.*

EXSIC.: Shear, New York State Fungi *19.*

DISTINGUISHING FIELD-MARKS: This species has been much confused with *L. vellerea* Fr. and *L. piperata* (L.) Fr., but differs decidedly from both. The mature glabrous form of *L. deceptiva* resembles the latter in general appearance, but the texture of the pileus, the broader and more distant gills, and the larger more echinulate spores distinguish it from that species. The pileus of *L. vellerea* is covered over the entire surface with a short velvety tomentum, while the center of *L. deceptiva* is practically glabrous

in the young state, and the margin is covered with cottony fibers forming a soft roll-like veil. The surface for some distance toward the center has the texture and the feeling of chamois-skin. In very wet weather the cottony roll on the margin sometimes feels slightly slippery.

6. LACTARIA GLAUCESCENS Crossl. Naturalist **1900**: 5. 3 Ja 1900. [As *Lactarius*]

Pileus fleshy, firm, thick, convex-umbilicate, then infundibuliform, white, becoming stained or spotted with yellowish-buff, dry, glabrous, 4–9 cm. broad, margin involute at first, even, naked; gills maize-yellow (*36. t. 1–4*) at first, becoming white as the pileus expands, staining glaucous-green (*253. t. 1.*) where the latex dries, forked, very close, adnate, 1–1.5 mm. wide; stem white, tapering downwards or sometimes nearly equal, solid, firm, 3–9 cm. long, 1.5 cm. thick at the base to 2 cm. at the apex; flesh whitish, staining glaucous-green where the latex dries; spores white, globose, minutely and sparsely echinulate, 5.5–7 μ, cystidia terete-clavate, 40–60 μ × 7–8 μ; latex white, drying glaucous-green on the flesh and gills, very acrid, abundant. (FIGURE 1.)

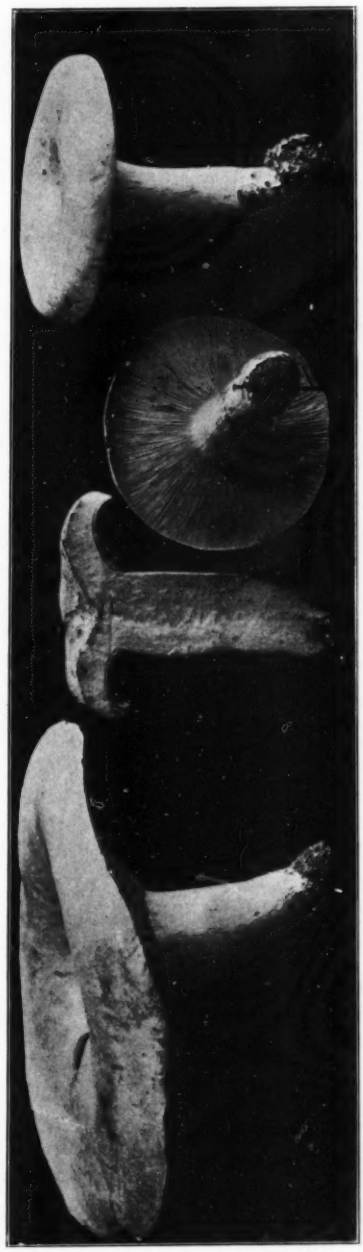

FIGURE 1. *Lactaria glaucescens* Crossl. *No. 17, 1907.*

HAB.: On the ground in sandy loam or in vegetable soil, oak-chestnut woods. July and August.

DISTRIB.: North Carolina, 1000 meters elevation, *Burlingham 17*, 1907.

ILLUST.: Crossland, New and Crit. Brit. Fungi, Naturalist 1900: 10. *f. 1–3*.

DISTINGUISHING FIELD-MARKS: The gills are very narrow and so crowded when young that a space between them is scarcely visible, and while tinted dull-yellowish when young, they become white with age. The abundant white latex dries glaucous-green, which characteristic separates the species from all the other members of this group. It differs from *L. pergamena* also by the thick flesh of the pileus, and from *L. piperata* in its narrower and more crowded gills. It was abundant in the "Pink Beds," North Carolina, in rather dry oak-chestnut woods, during the latter part of July and August. It is probable that it grows elsewhere, but has been referred to *L. piperata*.

7. LACTARIA INVOLUTA Soppit; Cooke, Handb. Br. Fungi, ed. 2, 380. 1883. [As *Lactarius*]

Pileus fleshy, firm, convex, then plane or slightly depressed, white with pale-ochraceous tinge, dry, smooth, glabrous, 2–5 cm. broad, margin arched, involute, extreme edge minutely silky; gills white, sometimes forked, densely crowded, somewhat decurrent, about 1 mm. broad; stem white, equal, or thickened below, glabrous, smooth, solid, 2.5 cm. long, 6 mm. thick; spores white, pip-shaped, smooth, 5 × 3 μ (5 × 7 μ); latex white, unchanging, very acrid, not scanty.

HAB.: On the ground, in woods or in grassy places on the edge of woods. July.

DISTRIB.: Connecticut, *Hanmer 1479*; Alabama, *Underwood & Earle*.

ILLUST.: Cooke, Br. Fungi, *pl. 1194*.

DISTINGUISHING FIELD-MARKS: This differs from the other *Piperatae* forms in its small size, and in the minutely silky covering on the margin of the pileus. The gills are as closely crowded as in either *L. glaucescens* Crossl. or *L. pergamena* (Swartz) Fr. The minute pip-shaped or obliquely elliptical spores also distinguish it.

In the Hanmer specimen the spores vary much in size, and in this as well as in the Alabama specimens they run a little larger than noted by Cooke, although spores as small as in that also occur. The spores are really the final test in determining this species and care must be taken not to mistake for it small specimens of some of the other species.

II. RUSTICANAE

Pileus without a pellicle, as in the *Piperatae*, and never viscid, though in some species somewhat moist; color always dark, varying from gray to brown or reddish-brown, tinted with lilac, while in *Lactaria atroviridis* the color is dark-green; flesh compact; latex usually very acrid, white and unchanging, although the wounds sometimes change color.

Synopsis of species

Pileus glabrous, at least at first.	
Gray to brown with lilac tints.	
Gills thin.	8. *Lactaria rusticana.*
Gills thick, pileus becoming rivulose-squamulose.	*Lactaria flexuosa.**
Fuliginous to brownish-black.	*Lactaria plumbea.**
Pileus scabrous-hairy.	
Olivaceous-green.	9. *Lactaria atroviridis.*

8. **Lactaria rusticana** (Scop.)

Agaricus rusticanus Scop. Fl. Carn. **2**: 452. 1772.

Agaricus pyrogalus Bull. Herb. Fr. *pl. 529. f. 1.* 1791; Hist. Champ. **1**: 487. 1809.

Lactarius pyrogalus Fr. Epicr. 339. 1838.

Pileus fleshy, firm, broadly convex, then plane to somewhat depressed, gray to livid-gray or brownish-gray, darker in the center, zoned toward the margin, moist in wet weather, but not viscid, glabrous, 3.5–6.5 cm. broad, margin glabrous, inrolled, then arched in mature specimens; gills cream to ochroleucous, rarely forking, distant, adnate, up to 5 mm. broad; stem paler than the pileus, silver-gray, tinted with ochroleucous, nearly equal, sometimes tapering downwards, glabrous, smooth, compact, 3–5 cm. long, 6–10 or 16 mm. thick; flesh white, compact, thick, unchanging; spores white, globose to subglobose, echinulate, greenish-hyaline, 6–6.5 μ × 6–8 μ; cystidia transparent, 16–20 μ long, 5–10 μ at the base, abruptly tapering; latex white, unchanging, very acrid. *Poisonous.*

HAB.: On open grassy places in woods. July to October.

* European species, the occurrence of which in the United States is doubtful.

DISTRIB.: New York, *Peck*, *Burlingham;* Vermont, *Burlingham 14*, 1906; Ohio, *Dawson;* Maryland, *Banning.*

ILLUST.: Banning, Folio Md. Fungi, *pl. 86;* Bull. Herb. Fr. *pl. 529. f. 1;* Gillet, Champ. Fr. *pl. 52* [*162; 390*]; Hahn, Der Pilz-Sammler, *f. 21* (poor); Krombh. Abbild. *pl. 14. f. 1–9;* Lanzi, Fung. Mang. *pl. 55. f. 2. a, b, c, d;* Noulet & Dass. Champ. *pl. 19. f. A;* Pat. Tab. Analyt. Fung. *pl. 121;* Rich. & Roze, Atl. Champ. *pl. 37. f. 13–15* (poor); Sicard, Hist. Nat. Champ. *pl. 45. f. 240.*

DISTINGUISHING FIELD-MARKS: The nearly plane pileus, with the margin remaining deflexed, the gray or brownish-gray zonate surface, the absence of viscidity, and the distant rather yellowish gills. In color it resembles both *Lactaria circellata* Fr. and *Lactaria flexuosa* Fr., from the former of which it may be distinguished by the lack of viscidity, and from the latter by the persistently glabrous surface, the more regular margin, and the less distant gills.

9. LACTARIA ATROVIRIDIS Peck, Ann. Rep. N. Y. St. Mus. **42**: 119. 1889

Pileus fleshy, compact, nearly plane, soon depressed in the center, olivaceous, azonate, dry, scabrous-hairy, sometimes cracking into small areas, 6–10 cm. broad, margin involute, at length spreading to uplifted; gills whitish, becoming mottled with dark-green, especially where injured, sometimes forking near the stem, close, adnate to slightly decurrent, rather narrow; stem colored like the pileus or paler, spotted, equal, dry, glabrous, firm, soon hollow, 2–5 cm. long, 1–2 cm. thick; flesh white; spores creamy-white, subglobose, echinulate, 7–8 μ; latex white, unchanging, but staining the gills green after some time, acrid.

HAB.: Deciduous woods. July and August.

DISTRIB.: New York, *Peck;* Connecticut, *Underwood & Earle;* District of Columbia, *Murrill.*

DISTINGUISHING FIELD-MARKS: *Lactaria atroviridis* closely resembles *Lactaria turpis* (Weinm.) Fr., especially when dried, but in the fresh condition it may be distinguished from it by the absence of viscidity in wet weather, by its dark-green color, and by the change in color of the wounded gills.

The type specimens of this species are in the herbarium of the N. Y. State Museum at Albany. The species seems to be rare.

DOUBTFUL SPECIES

LACTARIA PLUMBEA (Bull.) Fr. Epicr. 339. 1838. [As *Lactarius.*] — Schröter in Cohn, Krypt.-Fl. Schles. **3**: 536. 1889.

This species has been reported from New York by Peck; from Wisconsin by Bundy. The specimens referred to *Lactaria plumbea* by Peck differ from the typical form in color and in the presence of a tomentum in the fresh condition. It seems to me doubtful whether the New York specimens represent this species. They appear much like *L. glyciosma* but have no odor. Bundy's specimens are not preserved. The species is described in the Ann. Rep. N. Y. St. Mus. **38**: 127. 1885. A good figure of it may be found in Barla, Champ. Nice, *pl. 21. f. 1–5.* It is regarded as poisonous.

LACTARIA FLEXUOSA (Fr.) Fr. Epicr. 338. 1838. [As *Lactarius.*] — Schröt. in Cohn, Krypt.-Fl. Schles. **3**: 536. 1889

This European species has been reported from North Carolina by Schweinitz, from Vermont by Frost and by Burlingham. The specimens which I assigned to this species do not correspond closely enough to specimens which I have since received from Romell, to justify citing them as this species. The Frost and Schweinitz specimens are not preserved. The species is well figured by Cooke, Br. Fungi, *pl. 992.*

III. TORMINOSAE

Plants rather large, but the flesh not so compact as in the *Piperatae*, and the pileus viscid when wet; margin of the pileus inrolled at first and covered with long coarse tomentum, which may be persistent or fugacious. The latex varies from intensely acrid in *L. torminosa* to acrid in *L. speciosa.*

Synopsis of species

Latex white, becoming yellow.	
Pileus white, azonate.	13. *Lactaria resima.*
Pileus yellowish, zonate to subzonate.	12. *Lactaria scrobiculata.*
Latex white, wounds becoming heliotrope.	14. *Lactaria speciosa.*
Latex white, unchanging.	
Marginal tomentum persistent.	
Pileus zonate, some shade of yellow.	10. *Lactaria torminosa.*
Pileus azonate.	
White to flesh-colored tinged with fuscous.	11. *Lactaria cilicioides.**

* The latex sometimes very slowly turns yellowish.

Marginal tomentum fugacious.
Pileus white, zoned or spotted with red. *Lactaria sanguinalis.**

10. LACTARIA TORMINOSA (Schaeff.) Pers. Tent. Disp. Meth. Fung. 64. 1797

Agaricus torminosus Schaeff. Fung. Bav. Icon. **4**: 7 (index). 1774.

Lactarius villosus Clements, Bot. Surv. Neb. **4**: 20. 1896.

Pileus fleshy, convex, depressed in the center with the margin involute, finally nearly infundibuliform with the margin merely deflexed, pale pinkish-yellow or pale-ochroleucous or ochraceous tinged with incarnate, often zoned with deeper color, sometimes nearly white and azonate, viscid when wet, 4–10 cm. broad, center glabrous, margin persistently white-tomentose; gills whitish or cream-yellow tinged with pale-incarnate, some forking near the stem, close, decurrent, thin, 5 mm. broad; stem paler than the pileus, sometimes faintly spotted with yellow, equal or tapering downwards, glabrous or pruinose, smooth, stuffed, becoming hollow, 3–7 cm. long, 2 cm. or less thick; flesh white, not changing color; spores white, broadly elliptical, echinulate, uniguttulate, hyaline, 8–10 μ × 6–8 μ; latex white, unchanging, very acrid. *Poisonous.*

HAB.: In deciduous or coniferous woods, in open or shady places. August and September.

DISTRIB.: New York, *Peck, Underwood;* Maine, *Murrill, White;* Vermont, *Burlingham 56,* 1906, *Burt;* Connecticut, *Underwood;* Alabama, *Earle;* North Carolina, 1000 meters elevation, *Burlingham;* Colorado, 2900 meters elevation, *Clements;* Nebraska, *Clements.*

ILLUST.: Atkinson, Stud. Am. Fungi, *f. 118;* Barla, Champ. Nice, *pl. 18. f. 7–10;* Britz. Lact. *f. 5;* Bull. Herb. Fr. *pl. 529. f. 2, Agaricus Necator;* Cordier, Champ. Fr. *pl. 27. f. 1;* Eng. & Prantl, Nat. Pflanzenfam. **1**^{1}**: *f. 110 c;* Fl. Dan. *pl. 1068;* Fr. Sverig. Svamp. *pl. 28;* Gauthier, Champ. *pl. 11. f. 2* (poor); Gillet, Champ. Fr. *pl. 51* [*159; 395*]; Hahn, Der Pilz-Sammler, ed. 2. *f. 23;* Harzer, Pilze, *pl. 11;* Krombh. Abbild. *pl. 13. f. 15–23;* Lanzi, Fung. Mang. *pl. 57. f. 2. a, b, c, d;* L'Escluse, Études et Commentaires, *pl. 64. f. 1;* Lorinser, Essb. und Gift. Schwäm. *pl. 8. f. 8;* Lucand, Champ. Fr. *pl. 972;* Noulet & Dass. Champ. *pl. 17. f. B;* Phoebus, Deutschl. Krypt. Gift-

* European species, the occurrence of which in the United States is doubtful.

gewächse, *pl. 5;* Rich. & Roze, Atl. Champ. *pl. 37. f. 1–6;* Schaeff. Fung. Bav. Icon. *pl. 12;* Sicard, Hist. Nat. Champ. *pl. 43. f. 232;* Sv. Bot. *pl. 184;* Sowerby, Eng. Fungi, *pl. 103;* Venturi, Stud. Micol. *pl. 6. f. 53, 54.*

EXSIC.: Clements, Cryptogamae Formationum Coloradensium *364;* Herpell, Sammlung präparirter Hutpilze *46;* Karsten, Fungi Fennici, *508;* Sydow, Mycotheca Marchica *1504.*

DISTINGUISHING FIELD-MARKS: The large size, the persistent long whitish tomentum on the margin, and the unchanging white latex. The color of the pileus is some shade of yellow, sometimes tinted with incarnate, and it is usually zoned. The tomentum often extends from the margin midway to the center of the pileus. Occasionally, nearly white azonate forms occur.

After comparing the type specimens of *Lactarius villosus* Clements with both American and European specimens of *Lactaria torminosa* (Schaeff.) Pers. I have concluded that it is without question identical with the latter species. The spore-measurements run somewhat larger than indicated by Clements and the stem becomes hollow as shown both in the specimens and in the photograph accompanying the sheet in the Crypt. Format. Coloradensium.

This species is the *Agaricus piperatus* var. α L. Fl. Suec. 441. 1755, but not the *Agaricus piperatus* L. Sp. Pl. 1173. 1753, which from the synonyms given by Linnaeus is plainly the same as *Lactaria piperata* of Fries. In Monogr. Suec. **2**: 153, Fries describes the stem as "*subtiliter adpresse tomentosus l. glabratus,*" and Massee and Stevenson have followed Fries' description in this particular; but in all specimens which I have examined the stem appears to the naked eye as merely pruinose, and even with the aid of a lens it can scarcely be described as tomentose.

11. LACTARIA CILICIOIDES (Fr.) Fr. Epicr. 334. 1838. [As *Lactarius.*]—Hennings, in Eng. & Prantl, Nat. Pflanzenfam. 1^{1}**: 218. 1898

Agaricus tomentosus Otto, Versuch Agar. 74. 1816. Not *Agaricus tomentosus* Bull. Herb. Fr. *pl. 138.* 1782.

Agaricus cilicioides Fr. Syst. Myc. **1**: 63. 1821.

Pileus fleshy, not very compact, convex, becoming plane with

the center depressed, sometimes nearly infundibuliform, pale-incarnate tinged with fuscous, azonate, viscid when wet, entirely covered with matted tomentum, 5–10 cm. broad, margin involute, fibrillose-woolly; gills white to yellowish, forking, close, decurrent, rather narrow; stem whitish, sordid, never spotted or scrobiculate, equal, pruinose-silky when viewed with a lens, firm, stuffed, at length somewhat hollow, 5–7.5 cm. long, up to 2.5 cm. thick; flesh yellowish-white; spores white, minutely echinulate, broadly elliptical, 8 μ × 6–7 μ; latex white or pale yellowish-white, acrid, not abundant, sometimes becoming more yellowish when exposed to the air.

HAB.: "Woods and open places, especially near pine trees," Peck. September and October.

DISTRIB.: New York, *Peck*. It has also been reported from Maine by Ricker, and from Ohio by Morgan.

ILLUST.: Britz. Lact. *f. 2;* Cooke, Br. Fungi, *pl. 973;* Schaeff. Fung. Bav. Icon. *pl. 228, Agaricus crinitus.*

DISTINGUISHING FIELD-MARKS: This species may be distinguished from *Lactaria torminosa*, to which it is closely related, by the shorter and more matted tomentum covering the entire pileus, by the paler or duller-colored azonate pileus, and by the less abundant latex. At the margin of the pileus the tomentum becomes somewhat longer. It is finer than the tomentum on the margin of *Lactaria torminosa*.

Agaricus intermedius Krombh. *pl. 58. f. 11–13* has been considered a variety of *L. cilicioides*, but it seems to be more nearly *Lactaria scrobiculata* Scop. Massee, however, describes it as a distinct species. Krombholtz describes an *Agaricus tomentosus pl. 40. f. 17, 18* * as synonymous with *Agaricus tomentosus* of Otto, and Massee and Cooke have followed Krombholtz, but there does not seem to me to be sufficient evidence that Krombholtz' species is the same as that of Otto, while Otto's description agrees well with *Agaricus cilicioides* Fr. The specific name given either by Schaeffer or Otto was a homonym, hence *cilicioides* stands as the specific name.

12. LACTARIA SCROBICULATA (Scop.) Fr. Epicr. 334. 1838. [As *Lactarius.*]—Schröt. in Cohn, Krypt.-Fl. Schles. **3**: 341. 1889

Agaricus scrobiculatus Scop. Fl. Carn. **2**: 450. 1772.

Pileus fleshy, convex, soon depressed in the center, at length

* *Fig. 17* is lacking, and *f. 18* shows no tomentum.

infundibuliform, yellowish to ochraceous or even reddish-yellow, zoneless, or subzonate or conspicuously zonate, viscid when moist, 6–15 cm. broad, margin at first involute and tomentose, then spreading and plane or upturned and nearly or quite naked; gills whitish or pale-yellowish, sometimes forking close to the stem, crowded, adnate or slightly decurrent, thin; stem of the same color as the pileus or paler, with brighter-colored elliptical or orbicular scrobiculate spots, equal, glabrous, hollow, 3–7 cm. long, 1–2 cm. thick; spores white, minutely echinulate, 6.5–7 μ × 8–10 μ; latex white, quickly changing to sulphur-yellow, acrid. *Suspicious.*

HAB.: In moist woods. July to November.

DISTRIB.: New York, *Peck;* Vermont, *Frost;* Connecticut, *Earle;* Alabama, *Earle.*

ILLUST.: Barla, Champ. Nice, *pl. 18. f. 3–6;* Britz. Lact. *f. 1;* Cooke, Br. Fungi, *pl. 971;* Gillet, Champ. Fr. *pl. 154* [*392*]; Hahn, Der Pilze-Sammler, ed. 2. *f. 24;* Krombh. Abbild. *pl. 58. f. 1–6;* Lorinser, Essb. und Gift. Schwäm. *pl. 9. f. 6;* Lucand, Champ. Fr. *pl. 971;* Pat. Tab. Analyt. *pl. 409;* Schaeff. Fung. Bav. Icon. *pl. 227.*

DISTINGUISHING FIELD-MARKS: The yellowish, more or less zonate pileus, the coarse rather conspicuous tomentum on the margin of the young pileus, the bright-colored scrobiculate spots on the stem, and the rapid change in the color of the latex from white to sulphur-yellow. The plants are large and the margin becomes glabrous in the mature plant.

Lactaria scrobiculata is commonly described by European writers as azonate. But Fries in Monogr. **2**: 153, says "*vulgo azonus, interdum vero conspiciuntur zonae.*" Massee and Stevenson also describe it as sometimes zonate. The Alabama specimens are conspicuously zonate in the dried state, while the Connecticut specimens are zonate or subzonate. When the plants are growing in the open they fade more or less and this may account in part for the difference in zonation.

13. LACTARIA RESIMA (Fr.) Fr. Epicr. 336. 1838. [As *Lactarius.*] — Schröt. in Cohn, Krypt.-Fl. Schles. **3**: 542. 1889

Agaricus resimus Fr. Hym. Eur. 472. 1821.

Pileus fleshy, firm, deeply umbilicate with the margin involute, at length infundibuliform with the margin arched or spreading, whitish, soon faintly tinged with yellow, darker in the center,

azonate, viscid when wet, glabrous except the extreme margin, which is white-tomentose, at length entirely glabrous, 8 cm. or more broad; gills whitish or pale-cream, a few forking near the stem, close, decurrent, about 4 mm. broad; stem whitish, spotted with cream or dull-yellow, equal, glabrous, or pruinose at the top, stuffed, becoming hollow, 3.5 cm. long, 2.5 cm. thick; flesh white, odor rather strong when fresh and persisting for a time; spores white, globular to elliptical, echinulate, 5–7 μ × 7–9 μ; latex instantly changing to sulphur-yellow, acrid.

HAB.: In woods, chiefly in mountainous regions.

DISTRIB.: Vermont, *Burlingham 110*, 1906.

ILLUST.: Fr. Icon. *pl. 169. f. 1.*

DISTINGUISHING FIELD-MARKS: The whitish lily-shaped azonate pileus with a fringe-like white tomentum on the extreme margin, and the very rapid change in the color of the latex from white to sulphur-yellow. In the mature plant the tomentum is often lacking. The specimen found in Vermont was growing under a small spruce on the edge of a wood in a somewhat mountainous district. Near the edge of the pileus were four or five faint ridges or corrugations running parallel to the margin.

In Monogr. **2**: 152, Fries says of the stem "*sub lente pube tenuissima vix perceptibili tectus.*" In other places the stem is described as villous, but the statement in the Monograph is the more accurate. Our specimen, however was simply pruinose, and it is probable that the scarcely perceptible down mentioned by Fries was little more than a pruinosity, although there might be a variation in the nature of the covering under different environmental conditions.

14. **Lactaria speciosa** sp. nov.

Pileus fleshy, rather firm, convex-umbilicate, becoming depressed in the center with the margin arched, whitish, approaching honey-color or maize-yellow in the center and zoned with honey-color (*35. t. 3*), or maize-yellow (*36. t. 4*), viscid when wet, covered with long honey-colored tomentum arranged in concentric lines corresponding to the zones, 5–8 cm. broad, margin involute at first, at length spreading; gills white, becoming pale maize-yellow with age, staining heliotrope where injured, seldom forking, not very close, very slightly decurrent, 5–8 mm. broad; stem tinted with honey-yellow, with elliptical spots of flavous, sometimes scrobiculate, staining heliotrope where handled, equal, viscid

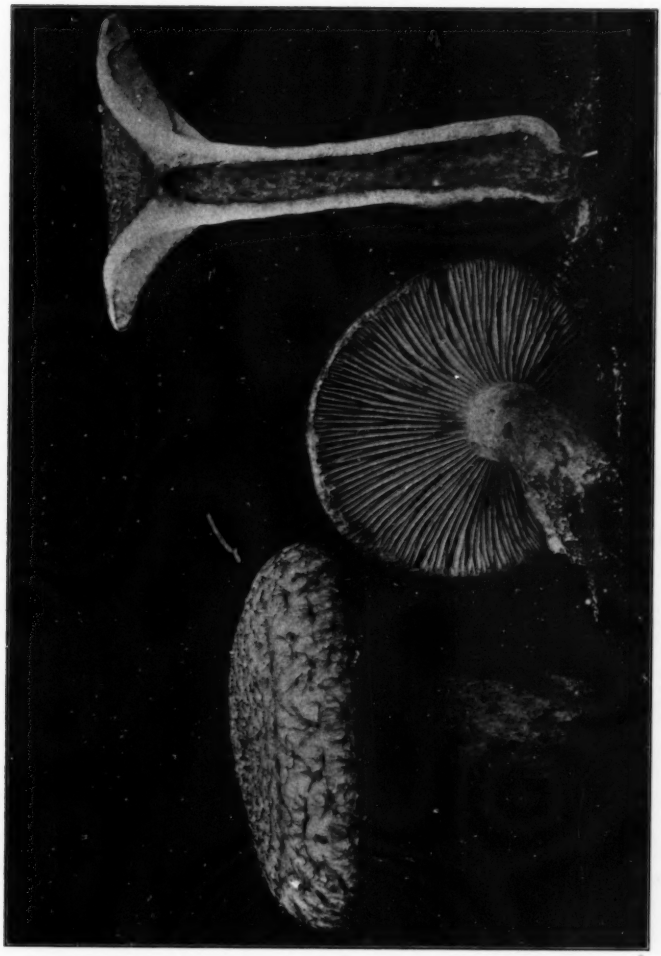

FIGURE 2. *Lactaria speciosa* Burl. *No. 40, 1907.*

when wet, sometimes slightly tomentose at the base, stuffed, becoming hollow, 2.5–7 cm. long, 1–1.5 cm. thick; flesh white, staining heliotrope where wounded, odor none; spores white, elliptical, strongly echinulate, 8–8.5 μ × 9.5–10 μ; latex white, not plainly changing, but staining the flesh and gills heliotrope (*188. t. 1*), mild to slightly acrid, abundant in young plants, scanty in old ones. (FIGURE 2.)

HAB.: In oak woods, sandy soil, oak-chestnut woods, frequently by wood-roads, in dry as well as wet weather. August and September.

DISTRIB.: "Pink Beds," North Carolina, 1000 to 1200 meters elevation, *Burlingham 40*, 1907 (type); Tennessee, 400 meters elevation, *Murrill;* Virginia, 670 meters elevation, *Murrill.*

DISTINGUISHING FIELD-MARKS: This species is readily recognized by the pallid pileus and the honey-colored tomentum and zones, together with the heliotrope color which injured parts assume. It was found abundantly during August in dry weather and in dry soil. The pileus is always zonate, the stem not at all or only slightly scrobiculate and the latex only slightly acrid. The tomentum is darker at the tips of the hairs, which become matted together in small clusters, thus standing out more prominently against the paler color of the pileus.

Lactaria speciosa is plainly not a degenerate form of *Lactaria scrobiculata* Fr. and the figure of *Lactaria repraesentanea* Britz. does not resemble this species and there is nothing in his brief description which would warrant considering the two species the same. Specimens of *Lactaria repraesentanea* Britz. presented to the N. Y. Botanical Garden by Romell differ from the type specimens of *Lactaria speciosa* in being glabrous except near the margin, azonate, and deeper- or brighter-yellow in color, while the spores are smaller and much less echinulate.

DOUBTFUL SPECIES

LACTARIA REGALIS Peck, Ann. Rep. N. Y. St. Mus. **26**: 64. 1874.
[As *Lactarius*]

The type specimens of this species differ from *L. resima* Fr. only in the glabrous margin, and it is uncertain whether the specimens represent a distinct species or whether they should be classed with *L. resima.* The margin of this latter species is at length gla-

brous and the stem is practically glabrous from the first. Although the type specimens of *L. regalis* do not show any very young plants, some of them seem to be young enough to have retained the tomentum on the margin. Since, however, only the type collection is known, I prefer to leave the species in doubt until further collections can be made.

LACTARIA SANGUINALIS (Batsch) Schröt. [*Lactarius controversus* Fr.]

This species has been reported from California by Harkness & Moore, but the specimens from which the determination was made were not preserved. The species is described in McIlvaine's One Thousand Am. Fungi, 164. 1902, and is well figured by Batsch, Elench. Fung. *pl. 36. f. 201;* by Fries, Sverig. Svamp. *pl. 29;* by Cooke, Br. Fungi, *pl. 1003;* and by Gillet, Champ. Fr. *pl. 160* [*381*]. *Edible.*

LACTARIA PUBESCENS (Fr.) Fr. This species was reported from New York by Peck (Ann. Rep. N. Y. St. Mus. **31**: 31. 1879), but was ommitted from his list of *Lactariae* in the 38th Report, 1885.

IV. CROCEAE

Pileus very viscid when young or in wet weather, the margin involute at first and covered with a short tomentum, some shade of yellow, zonate, plants large, flesh rather compact; gills darker with age, and more or less pruinose; latex acrid, white, changing to yellow.

Synopsis of species

Pileus maize-yellow tinted with yellowish-salmon, latex becoming sulphur-yellow.
16. *L. delicata*

Pileus saffron-yellow to orange-cadmium, latex becoming yellow-cadmium.
15. *L. crocea*

15. **Lactaria crocea** sp. nov.

Pileus fleshy, brittle, broadly convex-umbilicate with the margin involute, then expanding, depressed in the center with the margin deflexed, saffron-yellow to orange-cadmium (*49*), subzonate, expallent, very viscid when moist, glabrous, 5–10 cm. broad, margin involute and pruinose-downy at first, then glabrous; gills pallid, then honey-yellow (*35*), and at length yellowish-buff (*310. t. 1*), becoming cadmium (*47. t. 1*) where cut or bruised, seldom forking, not close, adnate, 5–6 mm. broad; stem of the same color as the pileus but paler, spotted, equal, glabrous or sometimes tomentose

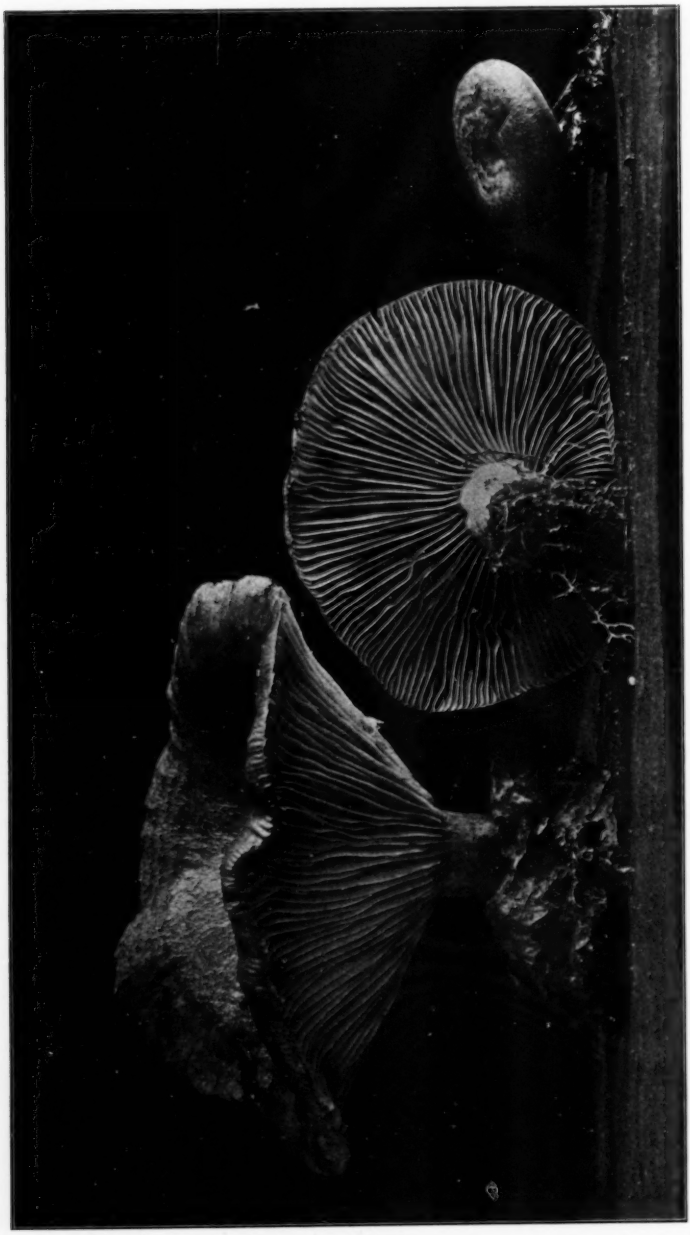

FIGURE 3. *Lactaria crocea* Burl. *No. 48*, 1907.

at the extreme base, stuffed, becoming hollow, stout, 5 cm. long, up to 16 mm. thick; flesh whitish, staining yellow-cadmium where cut, odor none; spores yellowish, broadly elliptical, echinulate, 7 μ × 8–8.5 μ; latex white, scanty, slowly becoming yellow-cadmium, and staining the gills and flesh, acrid. (FIGURE 3.)

HAB.: In oak and chestnut woods, growing from vegetable mold and dead leaves. August and September.

DISTRIB.: North Carolina, 1000 meters elevation, *Burlingham 48*, 1907 (type); Virginia, *Murrill.*

DISTINGUISHING FIELD-MARKS: The beautiful orange-cadmium color of the viscid pileus and stem, and the paler, rather distant gills, which become yellow-cadmium where wounded. The zones are sometimes very distinct, but more often obscure, especially in old age. The latex is scanty and the change in color is detected mostly by the change in the color of the wounded gills and flesh. The wounds never become greenish as in *Lactaria deliciosa*. The much deeper color of the plant, the more

FIGURE 4. *Lactaria delicata* Burl. *No. 72, 1907.*

viscid pileus, and the more distant gills separate this species from *Lactaria chrysorhea* and *Lactaria theiogala.*

16. **Lactaria delicata** sp. nov.

Pileus fleshy, firm, convex-umbilicate, at length nearly infundibuliform, maize-yellow (*36. t. 3*), tinted in the center with yellowish-salmon (*65*), faintly but decidedly zonate, viscid and covered with gluten when wet, glabrous, 8–12 cm. broad, margin involute at first and covered with coarse short tomentum, then merely deflexed and glabrous; gills whitish, becoming maize-yellow with age, some forking near the stem, close, slightly decurrent, 5–7 mm. broad; stem whitish to maize-yellow tinted with yellowish salmon, more or less scrobiculate-spotted, spots of the same color as the rest of the stem or duller, equal or tapering downwards, glabrous, stuffed, becoming hollow, 4–5 cm. long, 1.5–2.5 cm. thick; flesh white, odor strong; spores tinted yellowish-salmon in mass, subglobose, echinulate, 7–8 μ; latex white, becoming sulphur-yellow, acrid, scanty. (FIGURE 4.)

HAB.: In sandy loam and dense shade, oak and chestnut woods. July and August.

DISTRIB.: "Pink Beds," North Carolina, 1000 meters elevation, *Burlingham.*

DISTINGUISHING FIELD-MARKS: The large size, the delicate yellowish-salmon tint over nearly the whole pileus, the faint nearly concolorous zones, the short tomentum on the margin of the immature pileus, the rather persistent viscidity, the lily shape of the mature pileus, and the change in the color of the latex.

This species may be distinguished from *Lactaria scrobiculata* by the less conspicuous tomentum on the margin of the pileus, the dull color of the less prominent scrobiculate spots on the stem, the yellowish spores, and the change in the color of the gills. It differs from *Lactaria theiogala* in color, in the greater viscidity of the pileus, the presence of short tomentum on the margin of the young pileus, the stouter character of the plant, the more infundibuliform pileus, and in the scanty, more acrid milk. The type specimens are in the herbarium of the N. Y. Botanical Garden.

V. AGGLUTINATAE

Pileus very viscid when young or in wet weather, margin involute at first and covered with a short tomentum, color from white to buff and umber with greenish tinge, becoming deeper in drying,

FIGURE 5. *Lactaria agglutinata* Burl. *No. 59*, 1907.

flesh rather firm, plants medium-sized to large; gills becoming deeper in color with age and more or less pruinose; latex acrid, white, unchanging.

Synopsis of species

Pileus whitish.	
Zonate, sparsely covered with coarse, short tomentum.	18. *L. lanuginosa.*
Azonate, glabrous.	*L. subinsulsa.**
Pileus buff, papillate when wet, squamulose when dry.	17. *L. agglutinata.*
Pileus olivaceous-umber, blackening in drying.	19. *L. turpis.*
Pileus grayish-green, zonate, not blackening.	*L. blennia.*†

17. **Lactaria agglutinata** sp. nov.

Pileus convex-umbilicate, then depressed in the center with the margin uplifted, at length infundibuliform, buff (*309. t. 4*), fading to buff (*310*) when mature, slightly zonate when young, scarcely so when older, slimy-viscid when wet, with subrugose elevations or papillae showing through the gluten, appearing squamulose to squarrulose when dry, 6–10 cm. broad, margin involute and minutely pubescent at first, the pubescence becoming less noticeable as the margin unfolds; gills yellowish-buff (*310. t. 1*), some forking near the stem, close, slightly decurrent, 2–4 mm. broad; stem of the same color as the pileus or paler, sometimes spotted, equal or tapering downwards, viscid when wet, glabrous, firm as though solid, becoming spongy to hollow, 2.5–4 cm. long, 1–1.5 cm. thick; spores creamy-white in mass (*10. t. 1, 2*), subglobose, echinulate, 7–8 μ; flesh white, odor somewhat like raw pumpkin; latex white, unchanging, acrid. (FIGURE 5.)

HAB.: Among dead leaves, in rather sandy soil, oak-chestnut woods, frequently under the flowering dogwood. August and September.

DISTRIB.: "Pink Beds," North Carolina, 1000 meters elevation, *Burlingham 59*, 1907.

DISTINGUISHING FIELD-MARKS: The medium size, buff color, and the papilliform and rugose elevations showing through thick, glistening gluten when wet, and the squamulose appearance of the pileus when dry. One peculiarity of the pileus is that if it becomes wet again after having dried, the squamules swell up and the surface appears papilliform and rugulose as at first.

This species seems to be quite distinct. While resembling the *Triviales* in the very viscid character of the pileus, it also approaches

* Doubtful species.

† European species, the occurrence of which in the United States is doubtful.

the *Torminosae* in the minutely tomentose condition of the margin of the young pileus. The gills become somewhat pruinose in the mature plant. While not abundant, the species was found several times during August and September, in as many different places.

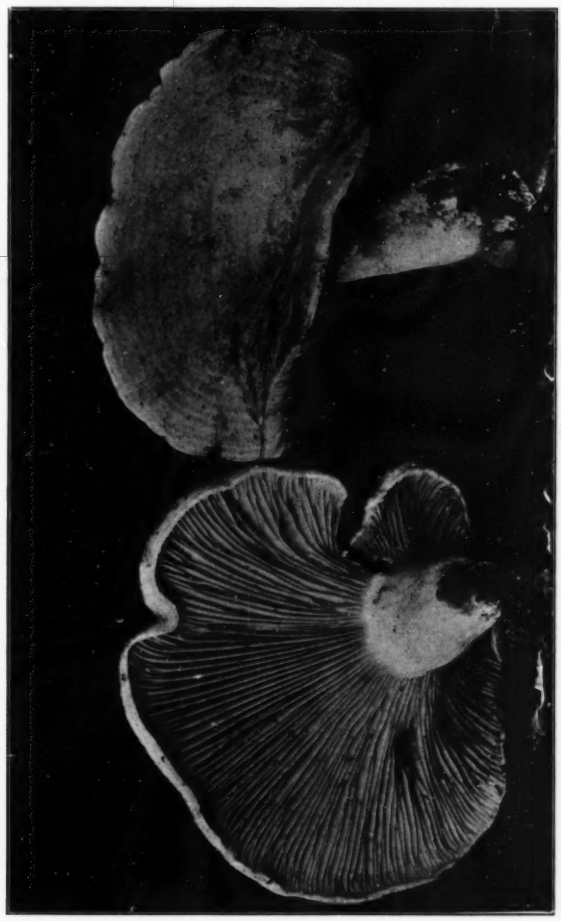

FIGURE 6. *Lactaria lanuginosa* Burl. *No. 67, 1907.*

18. **Lactaria lanuginosa** sp. nov.

Pileus fleshy, firm, convex-umbilicate, then expanding and depressed in the center, whitish to yellowish-flesh (*68*), zoned especially toward the margin, where the zones are close and narrow, viscid, sparsely covered with agglutinated short white coarse tomentum, 7–8 cm. broad, margin involute at first and the extreme

edge covered with fine short tomentum, at length glabrous and upturned; gills whitish, at length maize-yellow (*36. t. 3*) to yellowish-buff (*310. t. 2*), seldom forking, close, slightly decurrent, 3–5 mm. broad; stem white, becoming yellowish-buff spotted more or less with darker, equal or tapering downwards, viscid when young or wet, minutely pubescent to hairy tomentose, then nearly glabrous, firm, stuffed, then hollow, 3 cm. long, 1–2 cm. thick; flesh white, unchanging, odor rather strong; spores white, nearly globose, echinulate, 6–7 μ; latex white, unchanging, scanty, astringent, not very acrid. (FIGURE 6.)

HAB.: Among dead leaves under oak, maples, alder, and *Rhododendron*. August and September.

DISTRIB.: North Carolina, *Burlingham*.

DISTINGUISHING FIELD-MARKS: The large, whitish, zonate pileus, covered with short sparse, agglutinated tomentum. The zones seem to be concentric translucent rings, which appear cream-colored in contrast with the opaque white of the remainder of the pileus. The tomentum is more noticeable when the viscidity has disappeared. In the dried plant the rings are conspicuous and bright-colored.

I found this species in the "Pink Beds," North Carolina, five times during August and September. It seems to be quite distinct from any other species. The type specimens, *no. 67*, 1907, are in the herbarium of the N. Y. Botanical Garden.

19. LACTARIA TURPIS (Weinm.) Fr. Epicr. 335. 1838. [As *Lactarius*]

Agaricus Necator Pers. Syn. Fung. 435. 1801. Not *Agaricus Necator* Bull. Herb. Fr. *pl. 14; pl. 529. f. 2.* 1780.

Agaricus turpis Weinm. Sylloge Plant. Nov. **2**: 85. 1828.

Lactarius sordidus Peck, Ann. Rep. N. Y. St. Mus. **23**: 119. 1872.*

Pileus fleshy, firm, thick, convex-umbilicate, then plane to depressed in the center, yellowish-brown or umber, with olivaceous tinge, darker in the center, azonate, slimy-viscid in wet weather, glabrous or agglutinated-fibrous, 6–12 cm. broad, margin involute at first and yellow-villose, then glabrous; gills cream-colored, then darker yellow, becoming nearly black where bruised, then ash-colored from the spores, many forking near the stem, close, somewhat decurrent, 3–4 mm. broad; stem of the same color as the pileus, equal or slightly smaller at the base, viscid when wet,

* Report of Botanist published in advance.

glabrous, smooth or somewhat scrobiculate, or sometimes merely spotted, spots becoming nearly black in dried specimens, firm, stuffed, occasionally becoming hollow when old, usually 3–4 cm. long, 1.5–2.5 cm. thick; flesh whitish, odor slight; spores white, globose to subglobose, echinulate, 6.5–8 μ; latex white, unchanging, acrid. Possibly edible.

HAB.: On the ground in mixed woods, often near fir or spruce trees. August and September.

DISTRIB.: New York, *Peck;* Vermont, *Jones, Burlingham;* Maine, *White;* Connecticut, *Hanmer;* Ohio, *Beardslee;* it was also reported from North Carolina by Schweinitz.

ILLUST.: Cooke, Br. Fungi, *pl. 987;* Fl. Dan. *pl. 1913;* Fr. Sverig. Svamp. *pl. 60;* Gillet, Champ. Fr. *pl. 158* [*397*]; Hahn, Der Pilz-Sammler, ed. 2. *f. 22;* Harzer, Pilze, *pl. 60;* Krombh. Abbild. *pl. 69. f. 1–6;* Lorinser, Essb. und Gift. Schwäm. *pl. 9. f. 2;* Lucand, Champ. Fr. *pl. 41;* Phoebus, Deutschl. Krypt. Giftgewächse, *pl. 6. f. 1–3;* Roumeg. Crypt. Illustr. *f. 120.*

EXSIC.: Karsten, Fungi Fennici *306;* Sydow, Mycotheca Marchica *1009.*

DISTINGUISHING FIELD-MARKS: The yellowish-brown or olivaceous color of young plants and the blackish color of mature plants, the slimy condition of the whole mushroom in wet weather, the blackening of the gills with injury or in drying, and in many cases the grayish color due to the presence of the spores. The pileus may be covered with villose fibers which are closely stuck to the surface, and are not easily distinguishable, or it may be practically glabrous. The yellow down or villosity on the margin disappears in the mature plant, and is at no time conspicuous.

I have compared the type specimens of *Lactarius sordidus* Peck with European specimens of *Lactaria turpis* and have not been able to detect any specific difference. Some of the European forms show the stem to be slightly spotted, and some of the specimens of *L. sordidus* have slightly scrobiculate spots on the stem. These spots become more prominent in drying.

DOUBTFUL SPECIES

LACTARIA SUBINSULSA Peck, Ann. Rep. N. Y. St. Mus. **43**: 19. 1890. [As *Lactarius*]

Pileus fleshy, firm, convex to nearly plane, umbilicate, whitish, azonate, viscid, glabrous, 5–10 cm. broad, margin involute and

slightly tomentose at first, soon naked ; gills whitish, close, adnate to decurrent, narrow ; stem whitish, not spotted, obscurely rugulose-reticulated, 2.5–4 cm. long, 12–16 mm. thick ; spores subglobose ; latex white, unchanging, tardily acrid.

HAB.: Pine groves. August.

DISTRIB.: New York, *Peck*.

I have not seen this plant living, and the above description is arranged from the original description and from the dried specimens. The type specimens are in the herbarium of the N. Y. State Museum at Albany. The plant has not been found since the type collection and the dried specimens so closely resemble *L. affinis* Peck as to be indistinguishable from that species and at present I am inclined to regard it as the same.

* LACTARIA BLENNIA (Fr.) Epicr. 337. 1838. [As *Lactarius.*] —Hennings, in Eng. & Prantl, Nat. Pflanzenfam. 1[1]** : 217. 1898

Agaricus aerugineus Lamarck, Fl. Fr. 1 : (107.) 1778.

This species has been reported from Connecticut by White on the basis of specimens collected by Hanmer, and from Minnesota by Johnson. I have seen the Hanmer specimens and they are all *Lactaria turpis* (Weinm.) Fr. The Johnson specimens are not available for examination. For these reasons I omit this species from the list of our known *Lactariae.* A description of the species is given in McIlvaine's One Thousand Am. Fungi. The following may further help in the recognition of the species should it be found and will also enable one to avoid confusing it with related species.

DISTINGUISHING FIELD-MARKS : The grayish-green viscid pileus, zoned with drop-like concentric spots. It may be distinguished from *Lactaria turpis* (Weinm.) Fr. by the paler-green color, by the more inconspicuous down on the margin of the pileus and the otherwise glabrous surface and by the wounds of the gills turning cinereous. The gills do not become blackish in drying as do those of *L. turpis.* Regarded as poisonous.

VI. ASPIDEAE

Pileus very viscid when young or in wet weather, and the margin minutely tomentose or pruinose-downy to nearly glabrous

* The name of this species should be **Lactaria aeruginea** (Lamarck).

when young, wounds becoming lilac; gills somewhat darker with age and slightly pruinose.

While *Lactaria aspidea* and *Lactaria aspideoides* have a deciduous minute tomentum on the margin of the young pileus, the other species are merely pruinose-downy to almost glabrous, and all the species agree in being entirely glabrous when mature. This, together with the extreme viscidity of the pileus and the lilac color assumed by the wounds, indicates their relationship. *Lactaria speciosa* seems to be more closely related to the *Torminosae* by its very long tomentose covering and less viscid surface.

Synopsis of species

Pileus gray.	
Conspicuously zoned and spotted, 7–12 cm. broad.	23. *L. maculata.*
Faintly zoned or azonate, up to 8 cm. broad.	22. *L. lividorubescens.*
Pileus yellow.	
Azonate, latex acrid.	20. *L. aspidea.*
Zonate, latex bitter.	21. *L. aspideoides.*

20. LACTARIA ASPIDEA (Fr.) Fr. Epicr. 336. 1838. [As *Lactarius.*]— Hennings, in Eng. & Prantl, Nat. Pflanzenfam 1[1]**: 218. 1898

Agaricus aspideus Fr. Obs. Myc. **2**: 189. 1818.
Agaricus roseo-violascens Lasch, Linnaea **3**: 161. 1828.

Pileus fleshy, not thick, plane to convex, slightly papillate, at length depressed, straw-colored, somewhat sordid, azonate, viscid, 3–10 cm. broad, margin at first with a zone of white silky deciduous tomentum, then entirely glabrous; gills white or cream, rather close, somewhat thick, of various lengths, here and there connected by branches,about 2 mm. broad; stem of the same color as the pileus or paler, nearly equal, even, glabrous, stuffed, then hollow, 5–8 cm. long, up to 15 mm. thick; flesh white, becoming lilac where wounded; spores globular, echinulate, 8–10 μ; latex white, changing to lilac, acrid. *Poisonous.*

HAB.: In moist places under willows, and in the border of woods. September.

DISTRIB.: New York, *Peck.*

ILLUST.: Lanzi, Fung. Mang. *pl. 56. f. 2. a, b, c, d;* Cooke, Br. Fungi, *pl. 1083; Agaricus pudibundus** Pico, Mém. Soc. Med. Par. *pl. 12.* 1780.

* This name was preoccupied. See Scop. Fl. Carn. **2**: 452. 1772.

DISTINGUISHING FIELD-MARKS: The pale-yellow or straw-colored pileus, the absence of zones, and the acrid latex.

This species has been found but once in the United States. Peck notes that the stem was not spotted in his specimens, and that the spores were broadly elliptical or subglobose.

Lactarius uvidus Krombh., which has commonly been referred to *Lactaria aspidea* Fr., does not seem to me to agree closely enough to warrant considering it this species. Krombholz describes the color of the pileus as "braun," and that of the stem and gills as white.

21. LACTARIA ASPIDEOIDES Burl. Bull. Torrey Club **34**: 87. 1907. [As *Lactarius*]

Pileus fleshy, rather firm, convex-umbilicate, then plane, becoming infundibuliform with age, sulphur-yellow (*18*) with narrow zones of butter-cup yellow (*22*), glabrous, 3–4.5 cm. broad, very viscid when wet, gluten thick and persisting, margin involute and minutely tomentose at first, then spreading and glabrous; gills whitish, then cream-colored spotted with yellow, staining lilac where wounded, sometimes forking next the stem, close, adnate, but acute at the inner end, 4 mm. broad; stem sulphur-yellow, often spotted with butter-cup yellow, equal or abruptly smaller at the base, viscid when young or wet, glabrous, stuffed, becoming hollow, 2–3.5 cm. long, 6–10 mm. thick; flesh whitish, changing to faintly lilac where exposed to the air; spores white, globular to broadly elliptical, echinulate, 5–7 μ × 7–8 μ; latex white, becoming lilac where in contact with the broken flesh, taste bitter.

HAB.: In grassy hillside sheep-pasture near small fir trees, after heavy rain and warm weather. September.

DISTRIB.: Vermont, 523 meters, *Burlingham 115*, 1906.

DISTINGUISHING FIELD-MARKS: The bright-yellow color of the entire plant, the very viscid zonate and glabrous pileus, the broad, short, chaff-like tomentum on the extreme edge of the young pileus, and the lilac color assumed by the wounded flesh or gills. The latex does not seem to change color except where in contact with the flesh. This species is most closely related to *L. aspideus* Fr., but differs in its brighter color, the zonate pileus, the smaller size, and the bitter latex. It can readily be distinguished from *L. speciosa*, since the pileus of the latter is covered with long tomentum and is pallid, with honey-colored zones. *L. aspideoides* is also a much smaller plant.

22. **Lactaria lividorubescens** (Batsch)

Agaricus lividorubescens Batsch, Elench. Fung. **2**: 51. *pl. 36. f. 202.* 1789.

Agaricus uvidus Fr. Obs. Myc. **2**: 191. 1818.

Lactarius uvidus Fr. Epicr. 338. 1838.

Lactarius livescens Passerini, Nuovo Giorn. Bot. Ital. **4**: 105. 1872.

Pileus fleshy, firm, then more lax, rather thin, convex, then plane to depressed, often umbonate, cinereous or brownish-gray, tinged with lilac, often faintly spotted and zonate especially when young, viscid, glabrous, 4–8 cm. broad, margin at first inrolled then spreading except the extreme edge, which remains inrolled for some time and is at first white-pruinose to minutely downy; gills white to cream, quickly changing to lilac then violet when wounded, sometimes a few forking next the stem, close, thin, of various lengths, adnate to slightly decurrent, up to 5 mm. broad; stem white to cream, not spotted or only obscurely so, equal or tapering upwards, a little viscid when moist, glabrous, sometimes tomentose at the base, stuffed, becoming hollow, 4–8 cm. long, 6–12 mm. thick; flesh white, changing to lilac where wounded; spores white, elliptical, echinulate, 7 μ × 8–12 μ; latex white at first, changing to dark-lilac or violet where in contact with the the flesh, acrid, sometimes bitter.

HAB.: On the ground in woods, in moist places. August and September.

DISTRIB.: New York, *Peck;* Maine, *White;* Vermont, *Burlingham 63,* 1906; Connecticut, *Earle, Benedict;* Maryland, *Banning.*

ILLUST.: Banning, Folio Md. Fungi, *pl. 80;* Batsch, Elench. Fung. *pl. 36. f. 202;* Bern. Champ. Roch. *pl. 37. f. 1;* Britz. Lact. *f. 16;* Cooke, Br. Fungi, *pl. 991;* Gillet, Champ. Fr. *pl. 48 (157; 399);* Pat. Tab. Analyt. Fung. *pl. 209.*

DISTINGUISHING FIELD-MARKS: The gray or brownish-gray, very viscid pileus, the paler stem, and the lilac color which all parts of the plant assume where touched. The pileus may be faintly zonate but is never conspicuously zoned or spotted as in *Lactaria maculata* Peck, and the plant is rarely as large as the smallest specimens of *Lactaria maculata.*

Most European mycologists describe the latex as changing color upon exposure to the air. In Monogr. **2**: 162, Fries says,

"*Lac raro album persistit.*" It was evidently on the strength of the unchangeable milk that Passerini described his specimens as a distinct species, *L. livescens.* In the Vermont specimens I repeatedly watched the latex for fifteen minutes or even longer, and I could never detect any change except where the drop was in contact with the broken flesh.

Krombholz' description, accompanying his *pl. 57. f. 7–9*, accords with the characters of *Lactaria lividorubescens* but the plate does not represent this species, nor does it agree with his description. And *pl. 57. f. 14, 16* can scarcely be positively referred to *Lactaria lividorubescens*, hence I have omitted both of these in the plates cited.

23. LACTARIA MACULATA Peck, Ann. Rep. N. Y. St. Mus. **41**: 74. 1888. [As *Lactarius*]

Pileus fleshy, compact, convex-umbilicate, then depressed in the center or at length infundibuliform, gray to lilac-gray, distinctly zoned with concentrically arranged darker spots, viscid, glabrous, 7.5–12.5 cm. broad, margin involute, naked, then spreading; gills whitish or cream-colored, sometimes forking, close, adnate to decurrent; stem of the same color as the pileus or paler, spotted, equal or tapering downwards, glabrous, hollow, 2.5–5 cm. long, 10–16 mm. thick; flesh grayish becoming lilac where wounded; spores subglobose, echinulate, 10–12.5 μ in diam.; latex creamy-white, becoming lilac, acrid and unpleasant.

HAB.: "In thin woods, and pastures" (Peck).

DISTRIB.: New York, *Peck;* Vermont, *Morgan.*

DISTINGUISHING FIELD-MARKS: This species is to be distinguished from *Lactaria lividorubescens* Batsch by its larger size, the firmer flesh, and the conspicuously spotted-zoned pileus and the absence of an umbo. The stem is also more spotted.

Lactaria maculata was first described as a variety of *Lactaria uvida* Fr., under the name *magnus*, but after further field-work, was separated as a distinct species. I have not found this species, but from an examination of the type specimens at Albany, I consider it to be distinct from *L. lividorubescens.*

VII. INSULSAE

Pileus very viscid, entirely glabrous, some shade of yellow, flesh firm, plants rather large; gills becoming neither perceptibly darker with age, nor pruinose; latex very acrid, white, unchanging

Synopsis of species

Pileus azonate, spores white.	25. *L. affinis.*
Pileus zonate.	
Spores yellowish.	24. *L. insulsa.*
Spores white.	*L. zonaria.**

24. LACTARIA INSULSA (Fr.) Fr. Epicr. 336. 1838. [As *Lactarius.*]— Hennings, in Eng. & Prantl, Nat. Pflanzenfam. 1[1]**: 216. 1898

Agaricus insulsus Fr. Syst. Myc. 1: 68. 1821.

Pileus fleshy, firm, at length somewhat lax, convex-umbilicate, becoming depressed in the center, coppery-orange (*56*) with alternating zones of deeper and lighter tones, sometimes yellowish-buff (*310*) zoned with coppery-orange, center coppery-orange to red-ochre (*32. t. 4*), viscid, glabrous, surface not polished, and often marked with striae like the stem of a *Russula*, 4.5–10 cm. broad, margin involute at first and remaining arched until the last; gills white, becoming dull-reddish along the margins where rubbed, frequently forking near the stem, adnate, becoming decurrent as the pileus deepens, thin, fragile, 2 mm. broad; stem paler than the pileus, sometimes spotted with deeper color, tapering downwards, glabrous, stuffed, then hollow, 1.5–5 cm. long, up to 10–12 mm. or more thick; flesh white, no odor; spores pale Naples-yellow (*29. t. 1, 2*), globose, strongly echinulate, 7–8 μ, rarely 6 μ; latex white, unchanging, very acrid. *Suspicious.*

HAB.: On the ground, in rather open woods or by trails in mixed deciduous woods. July and August.

DISTRIB.: New York, *Peck;* Maine, *White;* Vermont, *Burt;* North Carolina, 1,000 meters elevation, *Burlingham 37*, 1907; Alabama, *Underwood, Earle;* Missouri, *Glatfelter 303.*

ILLUST.: Berk. Outl. *pl. 13. f. 2;* Bres. Fung. Mang. *pl. 62;* Cooke, Br. Fungi, *pl. 975* (good); Gillet, Champ. Fr. *pl. 386;* *Agaricus flexuosus* Hussey, Illust. Br. Myc. *pl. 59* (good); Krombh. Abbild. *pl. 12. f. 1–6* (good); Lanzi, Fung. Mang. *pl. 56. f. 1, a, b, c* (good); Rich. & Rose, Atl. Champ. Fr. *pl. 37. f. 10–12.*

DISTINGUISHING FIELD-MARKS: The reddish or coppery-orange color of the glabrous viscid pileus, which is marked more or less prominently with zones, especially toward the naked, involute margin, the paler, usually spotted stem, the whitish gills, and the unchanging acrid latex. The color of the pileus is sometimes more

* European species, the occurrence of which in the United States is doubtful.

yellowish, and according to Peck, may be nearly straw-colored, but the prevailing color of the North Carolina and Alabama specimens was like that described in the European plant.

25. LACTARIA AFFINIS Peck, Rep. N. Y. St. Cab. **23**: 116. 1873.* [As *Lactarius*]

Lactarius platyphyllus Peck, Ann. Rep. N. Y. St. Cab. **23**: 118. 1873.

Pileus fleshy, firm, convex-umbilicate, then plane to depressed in the center, ochraceous-yellow, azonate, very viscid in wet weather, glabrous, 6–12 cm. or more broad, margin involute, then merely arched, even, naked; gills whitish or cream-colored, not changing with age, but often becoming pruinose in drying, many forking near the stem, not very close, adnate to slightly decurrent, 4–10 mm. broad; stem yellowish, paler than the pileus, often spotted, nearly equal, viscid when wet, stuffed, becoming hollow, 3–6 cm. long, 10–22 mm. thick; flesh white, unchanging; spores whitish, globose to broadly elliptical, echinulate, 8 × 10 μ; latex white, unchanging, acrid.

HAB.: On the ground in mixed balsam and maple woods. August and September. (Pastures and copses, October, Peck.)

DISTRIB.: New York, *Peck;* Vermont, *Burlingham 60*, 1906; Massachusetts, *Morris;* Maine, *White.*

DISTINGUISHING FIELD-MARKS: The dull ochraceous, zoneless pileus, and the broad rather distant gills. Frequently the center is darker, apparently owing to the gluten remaining there after the rest of the pileus is dry. The latex sometimes dries a pale dull-green on the gills. The species is very closely related to *Lactaria insulsa* Fr., but its constantly duller color and the absence of zones, together with the broader and more distant gills, seem to separate it as a distinct species.

Lactarius platyphyllus Professor Peck has decided is a large form of *Lactaria affinis*, and I have accordingly given it as a synonym.

DOUBTFUL SPECIES

LACTARIA ZONARIA (Lamarck) Fr. Epicr. 336. 1838. [As *Lactarius.*] — Schröt. in Cohn, Krypt.-Fl. Schles. **3**: 538. 1889

Agaricus zonarius Lamarck, Fl. Fr. **1**: (108). 1778.

This species has been reported from Vermont by Frost, Rhode

* Separate published in advance in [Ap] 1872.

Island by Bennett, New Jersey by Ellis, Ohio by Morgan, Wisconsin by Bundy, Minnesota by Johnson, and from California by Harkness & Moore. I have seen only the Ellis specimens, in Ellis & Everhart, N. Am. Fungi, second series *1916*, and they do not resemble *L. zonaria*. The species is closely related to *L. insulsa* Fr., from which it differs in the firmer flesh, the unspotted stem, and the white spores. It is regarded by some as poisonous.

VIII. TRIVIALES

The triviales are characterized by the slimy-viscid glabrous pileus having the margin naked, and by acrid white latex. The latex does not change color, but in some species it stains the flesh or gills a pale dull gray-green. *L. trivialis* seems to be the most widely distributed species.

Synopsis of species

Pileus red. — **28.** *Lactaria hysgina.*
Pileus not red.
  Azonate; wounds of the gills becoming greenish.
    Pileus gray to putty-colored, spores yellow. — **26.** *Lactaria trivialis.*
    Pileus sepia, spores white. — **29.** *Lactaria mucida.*
  Zonate; wounds of gills not changing color.
    Pileus gray, zoned with raw-umber, fading to gray. — **27.** *Lactaria circellata.*

26. LACTARIA TRIVIALIS (Fr.) Fr. Epicr. 337. 1838. [As *Lactarius.*]—Schröt. in Cohn, Krypt.-Fl. Schles. **3**: 538. 1889

Agaricus trivialis Fr. Obs. Myc. **1**: 61. 1815.
Lactarius deflexus Lindblad, Monogr. Lact. Suec. 8. 1855.

Pileus fleshy, firm, depressed in the center with the margin arched, then plane to infundibuliform, plum-colored or smoke-gray, tinted with livid when young, fading, becoming putty-colored (*311. t. 1*) to snuff-brown (*303. t. 1*), or center darker with lilac tints (*196*), azonate, viscid, glabrous, up to 15 cm. broad, margin even, thin edge involute for some time, pruinose at first; gills cream-colored to yellowish, some forking, close, slightly decurrent, 5–7 mm. broad; stem cream-yellow, nearly equal but often inflated, glabrous, smooth, becoming hollow, 4–12 cm. long, 1–2 cm. thick; spores yellowish, elliptical, echinulate, 8 × 11 μ; flesh white, pale-greenish where the latex dries; latex white or creamy-white, unchanging, acrid.

HAB.: In mixed or deciduous woods. July to September.

DISTRIB.: New York, *Peck*, *Burlingham 3*, 1905; Vermont, *Burlingham*, *Frost;* New Hampshire, *P. Wilson;* Connecticut,

Earle, Hanmer 1826; Pennsylvania, *Herbst;** Virginia, 750 meters, *Murrill 173;* Tennessee, 400 meters, *Murrill 592;* North Carolina 1066 meters, *Burlingham 13*, 1907; Missouri, *Glatfelter 1249.*

ILLUST.: Britz. Lact. *f. 9;* Cooke, Br. Fungi, *pl. 976;* Krombh. Abbild. *pl. 14. f. 17, 18;* Lucand, Champ. Fr. *pl. 166.*

DISTINGUISHING FIELD-MARKS: The broad thick grayish pileus, which is depressed in the center, viscid, glabrous, and without zones; the paler stout stem; the creamy-white to yellowish gills, which become pale-greenish where the latex dries, or sometimes sordid where bruised; and the very acrid milk. L. *trivialis* Fr. differs from *L. mucida* Burl. in being very much larger, grayish instead of sepia, and in having yellowish spores.

One form of this species may be recognized. It has been described by Peck as *L. trivialis gracilis* and differs in its small size and slender character (pileus 2.5–5 cm. broad, stem equal to or larger than the diameter of the pileus). Peck has described one other variety, *maculata* but I should hesitate to consider this a form of *L. trivialis*, or even a variety in the old sense, because I can find no mention of a zonate characteristic in the European plant, and I have never found *L. trivialis* with any indication of zones. I am inclined to regard this as either a specimen of *L. circellata* or as an undescribed species.

27. LACTARIA CIRCELLATA (Fr.) Fr. Epicr. 338. 1838. [As *Lactarius.*] — Hennings, in Eng. & Prantl, Nat. Pflanzenfam. 1[1]**: 216. 1898

Agaricus circellatus Fr. Hym. Eur. 426. 1821.

Pileus fleshy, firm, convex, umbilicate, then plane becoming infundibuliform, gray to neutral tint, zoned and streaked with raw-umber (*301*), darker in the center, fading to gray when old, viscid in wet weather, glistening when dry, glabrous, 3–7 cm. broad, margin even, inrolled and pruinose at first; gills white to cream-colored, margins ochraceous when bruised, forking near the stem, close, adnate with a decurrent tooth, appearing more decurrent with age, up to 5 mm. broad; stem paler than the pileus, equal or tapering downwards, glabrous, smooth, firm, stuffed, at length hollow, up to 4 cm. long, 10–17 mm. thick; flesh white, grayish next the cuticle; spores white, subglobose, slightly echinulate, 6.5 μ × 7–8 μ, somewhat hyaline; latex white, unchanging, acrid.

* In the Herbst collection this is labeled *L. turpis* (Weinm.) Fr.

HAB.: In moist mixed woods. August and September.

DISTRIB.: Vermont, 500 meters elevation, *Burlingham 59*, 1906.

ILLUST.: *Omphalomyces circellatus acris* Batt. Fung. Arim. *pl. 13. f. D;* Cooke, Br. Fungi, *pl. 990;* Gillet, Champ. Fr. *pl. 380;* Sowerby, Eng. Fungi, *pl. 203.*

DISTINGUISHING FIELD-MARKS: This species may be distinguished from *Lactaria pyrogala* and *Lactaria flexuosa* by its viscid pileus, and from *Lactaria trivialis* by its zonate pileus and white spores. Although zoned and streaked with umber at first, the pileus fades to an even rather pale gray when old. In this state it can be distinguished from *L. trivialis* by the absence of yellowish color in the center of the pileus, the unchanging gills, and the white spores.

28. LACTARIA HYSGINA (Fr.) Fr. Epicr. 337. 1838. [As *Lactarius.*] — Hennings, in Eng. & Prantl, Nat. Pflanzenfam. 1^{1**}: 216. 1898

Agaricus hysginus Fr. Syst. Myc. 1: 67. 1821.

Pileus firm, fleshy, convex, then umbilicate, becoming depressed in the center, reddish-incarnate or blood-red-brown (*337*), darker in the center, shading into paler and even incarnate (*139. t. 1*) at the margin, fading with age, azonate, smooth, very viscid, viscidity persisting for some time, glabrous, smooth, 5–8 cm. broad, margin involute then arched and the extreme edge inflexed; gills white or creamy-white, becoming yellowish, often forking near the stem, close, adnate to slightly decurrent, 3–5 mm. broad; stem paler than the pileus, or sometimes of the same color, spotted with red or reddish-brown, nearly equal, viscid when wet, glabrous, stuffed, becoming hollow; flesh white in the pileus, reddish next the cuticle, faintly yellowish in the stem; spores whitish, subglobular to elliptical, echinulate, 6–8 μ × 8–10 μ; latex white, unchanging, acrid.

HAB.: In moist woods, especially near spruce trees, often in grassy places. July to September.

DISTRIB.: New York, *Peck;* Maine, *White;* Vermont, *Burlingham 57*, 1906.

ILLUST.: Britz. Lact. *f. 15* (poor); Cooke, Br. Fungi, *pl. 989;* Fries, Icon. *pl. 169. f. 2;* *Agaricus vietus* Krombh. Abbild. *pl. 14. f. 15, 16.*

DISTINGUISHING FIELD-MARKS: The red-brown azonate, very viscid pileus, acrid latex, and the medium-large size of the plant.

29. **Lactaria mucida** sp. nov.

Pileus fleshy, rather thin, convex-umbilicate, then plane, at length infundibuliform, warm-sepia (*305. t. 2, 3*) in the center, putty-colored (*311*) to stone-colored (*312*) on the extreme margin, azonate, very viscid and shining when wet, glabrous, 3–9 cm. broad margin, even at first, slightly wavy and striate in the old

FIGURE 7. *Lactaria mucida* Burl. *No. 92*, 1907.

plant; gills white, scarcely changing color with age, staining blue-greenish-gray where the milk dries (*249. t. 1*), sometimes forking near the stem, close, adnate to slightly decurrent, acute at the inner end, up to 7 mm. broad; stem of the same color as the pileus or paler, tapering upwards, slightly viscid when wet, glabrous, sometimes with faint striae, stuffed, then hollow, 4–7 cm. long, 7–10 mm. thick at the top, 10–15 mm. at the base; flesh white, odor none; spores white, broadly elliptical, echinulate, 7–8 μ × 8–9.5 μ; latex white, drying blue-greenish-gray on the gills and the broken flesh, acrid. (FIGURE 7.)

HAB.: Under hemlocks, in wet weather. Late August and September.

DISTRIB.: Vermont, *Burlingham 91*, 1906; North Carolina, 1000 meters elevation, *Burlingham 92*, 1907 (type).

DISTINGUISHING FIELD-MARKS: This species may be easily recognized by the contrasting dark-sepia color of the center, the whitish color of the margin of the pileus, and its slimy shining appearance, as well as by the blue-greenish-gray color of the dried latex. It closely resembles *Lactaria cinerea* Peck in size and texture, but differs in the habitat, in the color of the pileus, and in the change in color of the more acrid latex. While *L. cinerea* is most abundant in August, *L. mucida* does not appear until late in August and is most plentiful in September. I have found it only under hemlock trees, while *L. cinerea* seems to grow only under beech trees. From *L. trivialis* it may be distinguished by the white spores, the smaller size, the more lax flesh, and the absence of lilac tints in the color of the pileus, which does not become yellowish in fading.

IX. DELICIOSAE

Latex deep-colored and rather mild, pileus viscid; wounds, or even the entire plant when old, often becoming greenish; spores yellowish.

Three species have been described from Europe, *Lactaria deliciosa*, *Lactaria sanguiflua*, and *Lactaria haemorrhea* Lowe, the first alone being common to Europe and America. The remaining three species have been reported only from North America. All of the species resemble *Lactaria deliciosa* L. in many respects and form with it a natural group of which it may be taken as the type. *Lactaria Chelidonium* is most closely related to *Lactaria deliciosa*, while *Lactaria subpurpurea* appoaches *Lactaria sanguiflua*. *Lactaria Indigo* diverges more from the type. *L. salmonea* Peck seems to belong rather with the *Fuliginosae*.

Synopsis of species

Latex orange-colored.	30. *Lactaria deliciosa*.
Latex saffron-yellow.	31. *Lactaria Chelidonium*.
Latex dark-red.	32. *Lactaria subpurpurea*.
Latex indigo-colored.	33. *Lactaria Indigo*.

30. LACTARIA DELICIOSA (L.) Fr. Epicr. 341. 1838. [As *Lactarius.*] —Schröt. in Cohn, Krypt.-Fl. Schles. **3**: 543. 1889

Agaricus deliciosus L. Sp. Pl. 1172. 1753.

Pileus fleshy, firm, convex-umbilicate, becoming plane, at length infundibuliform, orange, yellow-orange or paler, zoned with deeper orange, becoming paler with age, sometimes mixed with grayish and greenish tints, viscid when wet, glabrous, surface somewhat roughened, 5–12 cm. broad, margin even, glabrous, involute, then arched, at length upturned; gills deep-orange with yellowish reflections, paler when old, and becoming greenish with age or where bruised, many forking near the stem and shorter gills forking into the longer, often connected with cross veins at the base, close, somewhat decurrent, rather narrow; stem of the same color as the pileus, spotted with brighter orange, nearly equal, glabrous, or sometimes a little hairy at the base, smooth, stuffed, becoming hollow, 2.5–10 cm. long, 8–12 mm. thick; flesh yellowish, staining greenish next the gills and the exterior of the stem; spores yellow, subglobose to elliptical, slightly echinulate, more or less hyaline, 8–8.5 $\mu \times$ 8–11 μ; latex orange to red-orange, aromatic and somewhat acrid. *Edible.*

HAB.: In moist woods, especially under firs and hemlocks. August and September, or up to December and January in Florida.

DISTRIB.: New York, *Peck, Fisher, Burlingham 10,* 1905; Maine, *White;* Vermont, *Burlingham 44,* 1906, *Jones;* Connecticut, *Earle, Underwood;* Alabama, *Earle;* Florida, *Fawcett;* Colorado, 2680 meters elevation, *Clements.* It has also been reported from North Carolina by Schweinitz and by Curtis; from Ohio by Morgan; and from California by Harkness & Moore.

ILLUST.: Atkinson, Stud. Am. Fungi, *pl. 35. f. 1;* Badham, Escul. Fung. Eng. *pl. 6. f. 2;* Barla, Champ. Nice, *pl. 19. f. 1–5;* Bern. Champ. Roch. *pl. 39. f. 1;* Boyer, Champ. *pl. 32;* Bresadola, Fung. Mang. *pl. 64;* Britz. Lact. *f. 17;* Cooke, Br. Fungi, *pl. 982* (very good); Cordier, Champ. Fr. *pl. 25. f. 1* (poor); Eng. & Prantl, Nat. Pflanzenfam. 1[1]**: *f. 110 D;* Fl. Dan. *pl. 1131;* Gauthier, Champ. *pl. 11. f. 1* (bad); Gibson, Edible Toadstools and Mushrooms, *pl. 18;* Gillet, Champ. Fr. *pl. 49* [*166; 382*] (very good); Hahn, Der Pilz-Sammler, *f. 20;* Harzer, Pilze, *pl. 10* (good); Hussey, Illust. Br. Fung. 1: *pl. 67;* Krombh. Abbild. *pl. 11* (good); Lanzi, Fung. Mang. *pl. 53. f. 2* (good); Lorinser,

Essb. und Gift. Schwäm. *pl. 8. f. 5;* Lucand, Champ. Fr. *pl. 167* (good); McIlvaine, *pl. 41. f. 3* (poor); Noulet & Dass. Champ. *pl. 18. f. A* (bad); Rich. & Roze, Atl. Champ. Fr. *pl. 38. f. 1–5;* Rolland, Bull. Soc. Myc. Fr. **7**: *pl. 2. f. 2;* Schaeff. Fung. Bav. Icon. *pl. 11;* Sicard, Hist. Nat. Champ. *pl. 44. f. 237* (bad); Sowerby, Eng. Fungi, *pl. 202* (good); Fries, Sverig. Svamp. *pl. 6* (very good); Venturi, Studi Micol. *f. 55, 56;* Vittad. Descr. Fung. Mang. *pl. 42;* Viviani, Fung. Ital. *pl. 13.*

EXSIC.: Herpell, Sammlung präpariter Hutpilze *107;* Karsten, Fungi Fennici, *509;* Sydow, Mycotheca Marchica *610.*

DISTINGUISHING FIELD-MARKS: *Lactaria deliciosa* varies in color from orange to pale-yellow and is sometimes conspicuously zonedand again nearly azonate, but the color is always brighter and the zones are usually more marked than in *Lactaria Chelidonium*, and, while the latex may at first be saffron-yellow, it soon becomes red-orange and is always abundant. The color and the zonation of the pileus are most decided in the young plant. The change in the color of wounds from orange to greenish is often rapid, the whole plant becoming greenish where bruised or as it becomes old. At other times I have not been able to detect any greenish tint to the gills or other parts of the plant either with age or injury. The green color was very prominent in the specimens sent from Florida by Fawcett and it persisted in the dried mushroom.

31. LACTARIA CHELIDONIUM Peck, Ann. Rep. N. Y. St. Mus. **24**: 74. 1872. [As *Lactarius.*] — Hennings, in Eng. & Prantl, Nat. Pflanzenfam. **1**[1]**: 218. 1898

Pileus fleshy, firm, convex, then plane with the center more or less depressed, "grayish yellow or tawny," at length stained with bluish and greenish, usually with two or three narrow zones near the margin, slightly viscid when wet, glabrous, 5–8 cm. broad, margin involute at first and naked; gills saffron-yellow mixed with gray, sometimes forking, close, "anastomosing or wavy at the base," adnate, then slightly decurrent, narrow; stem of the same color as the pileus, nearly equal, glabrous, becoming hollow, 2.5–4 cm. long, 10–12 mm. thick; flesh whitish, staining saffron-yellow from the latex, then becoming bluish and at length greenish; spores yellowish, globular to broadly elliptical, echinulate, 7 × 8 μ (9 μ Peck); latex saffron-yellow, mild, scanty. *Edible.*

HAB.: "Sandy soil under or near pine trees" (Peck); also in dry spruce woods.

DISTRIB.: New York, *Peck, Earle;* Vermont, *Burlingham;* Connecticut, *Underwood;* Alabama, *Earle;* it has also been reported from Vermont by Frost and from North Carolina by Atkinson.

ILLUST.: Atkinson, Stud. Am. Fungi, *pl. 35. f. 2.* 1900.

DISTINGUISHING FIELD-MARKS: It is a paler yellow and duller in color than *Lactaria deliciosa*, the flesh is firm, the pileus scarcely viscid, the zones marginal, the stem short, the gills narrow, and the latex saffron-yellow rather than orange. It is usually found in dry woods in the vicinity of pine trees, while *Lactaria deliciosa* is most abundant in mossy wet woods, especially near hemlocks.

The type specimens are in the herbarium of the N. Y. State Museum at Albany.

32. LACTARIA SUBPURPUREA Peck, Ann. Rep. N. Y. St. Mus. **29**: 43. 1878. [As *Lactarius.*] — Hennings, in Eng. & Prantl, Nat. Pflanzenfam. **1**[1**]: 218. 1898

Pileus fleshy, convex umbilicate, then plane to infundibuliform, dark-red (Indian-lake, *105. t. 1*) zoned with hydrangea-pink (*132. t. 1*), zones becoming less marked with age, and the entire pileus except the margin approaching hydrangea-pink with a grayish luster, margin becoming Etruscan-red (*132*), the whole spotted more or less with emerald-green (*259*) when mature, somewhat viscid when wet, glabrous, 3–8.5 cm. broad, margin involute and pruinose at first, then plane to uplifted, gills colored like the pileus and fading and greenish with age, seldom forking, rather distant, slightly decurrent, 6–7 mm. broad; stem of the same color as the pileus, often spotted with dark-red, equal or tapering upwards, glabrous or pruinose, sometimes tomentose at the base, stuffed, becoming hollow, 3–7 cm. long, 8–15 mm. thick; flesh whitish to hydrangea-pink, instantly staining red next the gills and the surface of the stem, after some time becoming greenish, odor faint; spores yellowish, broadly elliptical, echinulate, often uniguttulate, 7–8 μ × 8–10 μ; latex Morocco-red (*95. t. 4*), rather mild. *Edible.* (FIGURE 8.)

HAB.: Usually moist woods in the vicinity of hemlocks. August, September, and October.

DISTRIB.: New York, *Peck, Burlingham 9,* 1905; Vermont, *Burlingham 109,* 1906; Massachusetts, *Morris;* Connecticut, *Underwood;* North Carolina, *Burlingham 51,* 1907.

ILLUST.: Ann. Rep. N. Y. St. Mus. **54**: *pl. 70. f. 1–6.*

DISTINGUISHING FIELD-MARKS: The peculiar mixture of dull dark-red, hydrangea-pink, and grayish in the coloring of the plant, and the dull dark-red latex. It has been found at elevations varying from 130 meters in New York to 1000 meters in North Carolina.

FIGURE 8. *Lactaria subpurpurea* Peck. *No. 51*, 1907, *Burlingham.*

Bresadola's figure of *Lactaria sanguiflua* Fr. in Fungi Tridentini **2**: *pl. 126.* 1892, closely resembles *Lactaria subpurpurea* Peck, but his description of the color and the taste of the milk as well as of the color of the pileus would not indicate that he had that species in hand. The figure, however, seems to accord with *L. subpurpurea* much more than with *Lactaria sanguiflua* Fr.

33. LACTARIA INDIGO (Schw.) Fr. Epicr. 341. 1838. [As *Lactarius.*]— Hennings, in Eng. & Prantl, Nat. Pflanzenfam. 1^{1**}: 218. 1898

Agaricus lactifluus Indigo Schweinitz, Syn. Fung. Carol. Super. 61. 1818.

Pileus fleshy, firm, convex-umbilicate, becoming plane to infundibuliform, indigo-blue when wet, fading when drier, often with a grayish luster, zonate, sometimes spotted, 5–12 mm. broad, margin naked; gills indigo-blue or paler, at length yellowish or sometimes tinged with green, some forking near the stem, close, somewhat decurrent, rather broad; stem of the same color as the pileus, often spotted, nearly equal, glabrous, smooth, firm, becoming hollow, up to 5 cm. long, 1–2 cm. thick; flesh sky-blue to darker, often becoming greenish; spores yellowish, globular to broadly elliptical, echinulate, 7 μ × 8–9.5 μ; latex dark-blue. *Edible.*

HAB.: In dry pine or oak woods. July to October (and November in Florida).

DISTRIB.: New York, *Peck;* Connecticut, *Underwood, Hanmer;* Vermont, *Jones;* Maryland, *Banning;* Virginia, *Murrill;* North Carolina, *Schweinitz;* South Carolina, *Ravenel;* Alabama, *Underwood;* Georgia, *Harper;* District of Columbia, *Murrill 1522;* Florida, *Fawcett.* It has also been reported from Pennsylvania by Herbst.

ILLUST.: Atkinson, Stud. Am. Fungi, *pl. 35. f. 3;* Banning, Folio Md. Fungi, *pl. 82* (excellent); McIlvaine *pl. 41. f. 2.*

DISTINGUISHING FIELD-MARKS: The more or less indigo color or tint which characterizes the entire plant.

X. QUIETAE

Pileus covered with a thin viscidity when moist, soon dry, surface entire, glabrous, and margin naked, flesh more lax and the plants usually smaller than in *Limacina;* gills becoming decidedly darker with age, and dusted with the spores; latex mild or only slightly acrid.

In these plants the viscidity disappears so quickly that it may not be noticed in dry weather unless the mushrooms are collected in the morning while covered with dew.

Synopsis of species

* Pileus 2–4 cm. broad.

Latex mild.	
Pileus mahogany-red, shining-viscid when moist.	35. *Lactaria nitida.*
Pileus fulvous, fading, papilla persisting dark.	36. *Lactaria oculata.*
Pileus brownish-drab to yellowish-brown, fading.	38. *Lactaria paludinella.*
Latex acrid.	
Pileus fulvous, margin crenate to sulcate.	37. *Lactaria minuscula.*

** Pileus 5–15 cm. broad.

Latex mild.

Pileus dark-red to reddish-cinnamon. 34. *Lactaria quieta.*
Pileus pale leather-colored. *Lactaria pallida.* *

34. LACTARIA QUIETA Fr. Epicr. 343. 1838. [As *Lactarius.*]—Schröt. in Cohn, Krypt.-Fl. Schles. **3**: 537. 1889

Agaricus quietus Fr. Syst. Myc. **1**: 69. 1821.

Pileus fleshy, rather thick, depressed in the center, dark-red to reddish-cinnamon, fading, obscurely zonate, viscid at first, soon dry, glabrous, 5–8 cm. broad, margin arched, even; gills white, becoming pale brick-red, sometimes forking near the stem, close, adnate to decurrent, 3–4 mm. broad; stem colored like the pileus, at length rubiginous, equal, glabrous, smooth, stuffed, at length hollow, 5–8 cm. long, up to 15 mm. thick; flesh white, becoming tinged with fulvous where broken, odor slight but disagreeable; spores white, echinulate, 8–10 μ × 6–7 μ; latex white, unchanging, mild. *Edible.*

HAB.: In deciduous woods.

DISTRIB.: New York, *Peck.*

ILLUST.: Cooke, Br. Fungi, *pl. 983.*

DISTINGUISHING FIELD-MARKS: This species may be distinguished from the other dark-red or fulvous-colored species in this group by the thicker pileus and stouter stem, and the faint zonation. The viscidity soon disappears, and Romell says: "I have never found this plant viscid."

35. LACTARIA NITIDA Burl. Bull. Torrey Club **34**: 89. 1907. [As *Lactarius*]

Pileus fleshy, rather thin, convex, then depressed in the center, umbonate, mahogany-red (*335*) more golden-red toward the margin, umbo persistently dark, otherwise fading when dry, shining-viscid when wet, glabrous, smooth, 3 cm. broad, margin remaining arched for some time, even; gills yellowish, becoming pruinose, sometimes forking, close, slightly decurrent, broad; stem mahogany-red, equal or sometimes ventricose when growing in wet places, stuffed, becoming hollow, 4.5–5 cm. long, 5–8 mm. thick; flesh faintly buff, turning a little reddish where cut; spores white, echinulate, 5–6 μ × 6–8 μ; latex white, unchanging, mild.

HAB.: In grassy sheep pasture near hemlocks and in moist woods. September.

* European, occurrence in United States doubtful.

DISTRIB.: Vermont, 500 meters elevation, *Burlingham 114*, 1906.

DISTINGUISHING FIELD-MARKS: The mild milk and the mahogany-red color of the pileus and stem, together with the shining varnished appearance of the pileus when moist and viscid, make this little plant easily recognizable.

The type specimens are in the herbarium of the N. Y. Botanical Garden.

36. LACTARIA OCULATA (Peck) Burl. Bull. Torrey Club **34**: 89. 1907. [As *Lactarius*]

Lactarius subdulcis oculatus Peck, Bull. N. Y. St. Mus. **67**: 37. 1903.

Pileus fleshy, thin, convex, then depressed in the center, umbonate, rich-fulvous in the center, shading to buff-fulvous toward the margin, all except the papilla fading to pinkish with age, viscid in dew or wet weather, glabrous, smooth, 1.5–2.5 cm. broad, margin involute and pruinose at first, then arched and finally nearly plane, slightly crenate; gills whitish, then yellowish, at length pruinose, a few forking near the stem, close, slightly decurrent, rather broad, stem buff at the top, sublatericeous below the middle, equal, slightly viscid when wet, tomentose at the base, stuffed, up to 6 cm. long, 5 mm. thick, flesh buff-whitish; spores white, broadly elliptical to subglobose, echinulate, 6–7.5 μ × 8–9.5 μ; latex white, unchanging, mild.

HAB.: Under pine, hemlock, spruce, and balsam-fir trees, often in moss. July to September.

DISTRIB.: New York, *Peck;* Vermont, 500 meters elevation, *Burlingham 107*, 1906.

ILLUST.: Peck, Bull. N. Y. St. Mus. **67**: *pl. 83. f. 20–24.*

DISTINGUISHING FIELD-MARKS: The thin viscidity and fulvous color of the moist pileus, and the dark-fulvous or chestnut-colored spot which remains in the center of the pileus when the plant is dry. The viscidity and the expallent color separate this species from *L. subdulcis* (Pers.) Fr., while its larger size, paler color, mild milk, and persistent "eye-spot" serve to distinguish it from *L. minuscula* Burl.

37. LACTARIA MINUSCULA Burl. Bull. Torrey Club **34**: 88. 1907.
[As *Lactarius*]

Pileus fleshy, thin, broadly convex, with a small umbo, becoming plane then somewhat depressed in the center, fulvous in the center, cinnamon (*323. t. 1*) toward the still paler margin, azonate, viscid in wet weather, sometimes shining with viscidity, glabrous, 1–3 cm. broad, margin minutely crenate sometimes sulcate, often slightly wavy, pruinose at first; gills whitish, seldom forking, close, adnate or decurrent by a tooth, broad for the thickness of the pileus; stem fulvous near the base but paler toward the pileus,

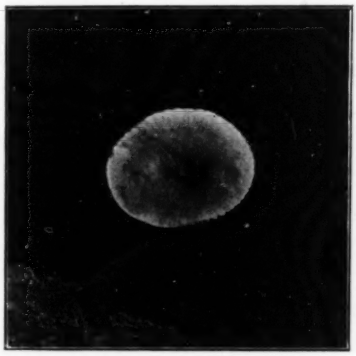

FIGURE 9. *Lactaria minuscula* Burl. *No. 56*, 1907.

FIGURE 10. *Lactaria minuscula* Burl. *No. 56*, 1907.

equal, glabrous, sometimes tomentose at the base when growing in moss, stuffed, becoming hollow, 2.5–4.5 cm. long, 3–4 mm. thick; flesh isabelline-white; spores white, subglobose, slightly echinulate, 6–8 μ; latex white, unchanging, acrid. (FIGURES 9, 10).

HAB.: In moist woods, in moss or on decayed wood, under yellow birches, black gum, and black oak. July and August.

DISTRIB: New York, *Peck;* Vermont, 500 meters, *Burlingham;* North Carolina, 1,000 meters, *Burlingham 56*, 1907.

DISTINGUISHING FIELD-MARKS: This species differs from all others in this group in its small size, crenate margin, and more acrid latex. It may be distinguished from *L. subdulcis* by its viscid pileus, and by being expallent. It is frequently solitary.

38. LACTARIA PALUDINELLA Peck, Ann. Rep. N. Y. St. Mus. **38**: 133. 1885. [As *Lactarius.*] — Hennings, in Eng. & Prantl, Nat. Pflanzenfam. 1[1]**: 214. 1898

Pileus fleshy, thin, convex, then plane-umbilicate to depressed in the center, sometimes with a small umbo, brownish-drab (*302. t. 2*) to dark-fawn (*307*),* expallent, slightly viscid when wet, glabrous, 12 mm. to 4 cm. broad, margin at length slightly striate; gills white to cream-colored, becoming darker with age, pruinose, many forking near the stem, close, adnate or slightly decurrent, thin, up to 4 mm. broad; stem of the same color as the pileus or paler, nearly equal, glabrous, except at the base, which is slightly villose when growing in moss, stuffed, sometimes hollow, 2–3 cm. long, 3–4 mm. thick; flesh white, or tinted with the color of the surface; spores white, subglobose, echinulate, 6.5–8.5 μ; latex white, unchanging, mild.

HAB.: In marshy places in woods, in *Sphagnum*, or in decaying leaves. August.

DISTRIB.: New York, *Peck;* Vermont, *Burlingham;* North Carolina, *Burlingham 82*, 1907.

DISTINGUISHING FIELD-MARKS: The sordid-brown color or the mixture of brownish-drab and yellow-brown, which gives the moist pileus a mottled, streaked, and subzonate appearance, and the striatulate margin. The species is small and is rendered inconspicuous by its dusky coloring. It occurs only in densely shaded places.

DOUBTFUL SPECIES

LACTARIA PALLIDA Pers. Tent. Disp. Meth. Fung. 64. 1797.

This species has been reported from Rhode Island by Bennett, Connecticut by White, and Minnesota by Johnson. I have seen Hanmer's *no. 1399*, which was cited as *pallida* by White, and it is not that species, but a pale form of *L. lactiflua* (L.). The plants from which the other determinations were made are not available for examination, and there is a reasonable doubt whether *L. pallida* occurs within the United States. It is edible.

XI. CINEREAE

Pileus more viscid than in the *Quietae*, of some shade of gray, perfectly glabrous, flesh lax and thin, plants rather fragile; gills becoming darker with age and pruinose; latex soon acrid.

*A yellowish-brown color, not fulvous.

Lactaria cinerea has been classed with the *Limacini* by Saccardo, but seems to belong rather to *Russularia* on account of the less acrid latex, the less viscid pileus, the more lax flesh, as well as the changing gills.

Synopsis of species

Latex white, not staining gills.	39. *Lactaria cinerea.*
Latex white, becoming gray.	*Lactaria vieta.**

39. LACTARIA CINEREA Peck, Rep. N. Y. St. Bot. **24**: 73. 1872. [As *Lactarius.*] — Hennings, in Eng. & Prantl, Nat. Pflanzenfam. 1^{1}**: 217. 1898

Pileus fleshy, thin, lax, convex at first, soon umbilicate to depressed in the center, at length infundibuliform, cinereous (*358*),

FIGURE 11. *Lactaria cinerea* Peck. *No. 105*, 1907, *Burlingham.*

darkest in the center, becoming pale toward the margin, fading, occasionally zonate, viscid when wet, glabrous, 2–5 cm. broad, margin involute at first, at length arched or uplifted, even; gills white, not changing color where bruised, often appearing pruinose, especially in dried plants, a few forking within 1 or 2 mm. of the stem, close, adnate, rather narrow; stem of the same color as the

* European species, the occurrence of which in the United States is uncertain.

pileus or paler, subequal but more often tapering upwards, frequently tomentose at the base, otherwise glabrous, spongy, soon hollow, 3–8 cm. long, 8–16 mm. thick; flesh white, not changing color; spores white, subglobose, minutely echinulate, 5.5–7 μ; latex white, unchanging, very acrid after a few seconds on the tongue. (FIGURE 11.)

HAB.: Under beeches or among beech leaves. July and August.

DISTRIB.: New York, *Peck*, *Earle;* Connecticut, *Underwood & Earle;* Maine, *White;* Vermont, *Morgan*, *Burlingham 13*, 1906; North Carolina, 1000 meters, *Burlingham 105*, 1907.

DISTINGUISHING FIELD-MARKS: The uniform pale-gray color, the thin pileus, which is glabrous, viscid, and usually azonate, but sometimes faintly zonate from the margin half-way to the center, the spongy stem, which usually tapers upwards, and the white close gills, which often become pruinose and do not become stained from the latex. I have found *Lactaria cinerea* only under or in the vicinity of beech trees. In North Carolina I rarely failed to find several specimens of it wherever even a solitary beech tree was growing in the midst of the oak-chestnut woods.

The type specimens of the species are in the State Herbarium at Albany. Many of the specimens which I found in Vermont and a few of North Carolina plants were faintly but decidedly zonate, the zones being narrow and more prominent toward the margin. Specimens collected by Morgan had this same characteristic. Peck considered the species to be related to *L. vieta* Fr. and it seems to belong in the group with this rather than with the *Limacini*, where it is placed by Saccardo. *Lactaria mucida* seems to stand between *L. cinerea* and *L. trivialis*, but is more closely related to the latter by the more acrid milk and the very slimy pileus.

DOUBTFUL SPECIES

LACTARIA VIETA (Fr.) Fr. Epicr. 344. 1838. [As *Lactarius.*] — Schröt. in Cohn, Krypt.-Fl. Schles. **3**: 541. 1889

This species was reported from Ohio by Morgan in his Mycologic Flora of the Miami Valley, but as the specimens are not preserved it is impossible to verify the determination. His description would indicate that he had the species which he thought. For this reason I append the following description:

Pileus fleshy, lax, thin, convex, subumbonate, then expanding, umbilicate to infundibuliform, incarnate, or livid-gray, fading to grayish, azonate, viscid when wet, finely silky when dry, 4–6 cm. broad, margin even, involute at first, then arched to uplifted; gills white then yellowish, thin, close, somewhat decurrent, 2 mm. broad; stem of the same color as the pileus, equal or tapering upwards, glabrous, dry, stuffed, becoming hollow, 5–8 cm. long, 4–6 mm. thick; flesh whitish, odor faint, but somewhat pungent; spores 8 μ, nearly globose, minutely echinulate; latex white, becoming gray, mild, then acrid.

HAB.: Damp woods.

ILLUST.: Britz. Lact. *f. 21;* Cooke, Br. Fungi, *pl. 1009;* Fries, Icon. *pl. 170. f. 1;* Gillet, Champ. Fr. *pl. 167.* [*401*]; Lucand, Champ. Fr. *pl. 96.*

EXSIC.: Sydow, Mycotheca Marchica *2721.*

XII. THEIOGALAE

Pileus slightly viscid when moist, soon dry, glabrous, margin naked or minutely pruinose-downy in the young plant when viewed with a lens, whitish to isabelline or fulvous or pinkish-buff; flesh rather thick and firm at first, then thinner and lax; gills becoming darker with age, and more or less pruinose; latex bitter or acrid, white, becoming yellow.

Synopsis of species

Latex very acrid, becoming golden-yellow.	42. *L. chrysorhea.*
Latex mild, bitterish, then acrid, becoming sulphur-yellow.	
Pileus whitish, entire plant becoming brownish-red with age, azonate.	41. *L. colorascens.*
Pileus pinkish-buff to reddish terra-cotta or fulvous, zonate.	40. *L. theiogala.*
Pileus pallid, azonate.	40. *L. theiogala brevis.*

40. LACTARIA THEIOGALA (Bull.) Fr. Epicr. 342. 1838. [As *Lactarius.*] — Schröt. in Cohn, Krypt.-Fl. Schles. **3**: 541. 1889

Agaricus theiogalus Bull. Herb. Fr. *pl. 567. f. 2.* 1793; Hist. 1: 495. 1809.

Hypophyllum lateritium Paulet; Paulet & Léveillé, Icon. Champ. 59. 1855.

Lactarius brevipes Longyear, Rep. Mich. Acad. Sci. **3**: 59. 1901.

Lactarius brevis Peck, Bull. N. Y. St. Mus. **94**: 33. 1905.

Lactarius xanthogalactus Peck, Bull. Torrey Club **34**: 346. 1907.

Pileus fleshy, firm and rather thick at first, then thinner and more lax, convex, sometimes with a small umbo, sometimes slightly umbilicate, then plane to depressed, incarnate-isabelline to yellowish-salmon (*65. t. 1–4*) or reddish-terra-cotta (*100*) to fulvous, more or less zonate, occasionally much paler and nearly or quite azonate, viscid when wet, glossy when dry, glabrous, 5–8 cm. broad, margin inrolled at first, and pruinose to very minutely pruinose-downy on the extreme edge; lamellae whitish to yellowish, reddish-brown

FIGURE 12. *Lactaria theiogala* (Bull.) Fr. *No. 44*, 1907, *Burlingham.*

when old or when injured, some forking near the stem, close, adnate or a little decurrent, up to 4 mm. broad; stem colored like the pileus or paler, sometimes faintly spotted, glabrous except at the base, which is often slightly tomentose, smooth, full and rather firm, at length hollow, 3–7 cm. long, 7–13 mm. thick; flesh white, becoming yellow from the latex, odor pungent, disappearing in drying; spores whitish, minutely echinulate, subglobose to broadly elliptical, 6–7 μ × 8–9 μ, latex white, changing to sulphur-yellow, bitterish then acrid. *Suspicious.* (FIGURE 12.)

HAB.: In both dry and moist woods, under spruce and fir trees, or in oak woods. August and September.

DISTRIB.: New York, *Peck, Earle, Burlingham;* Maine, *White;*

Vermont, *Jones, Frost, Burlingham 30*, 1906; Massachusetts, *Davis;* Connecticut, *Earle, Hanmer 2335;* Pennsylvania, *Herbst;* Maryland, *Shear;* Alabama, *Earle;* North Carolina, *Burlingham 44*, 1907; California, *Patterson.*

ILLUST.: Barla, Champ. Nice, *pl. 27. f. 14–16;* Bull. Herb. Fr. *pl. 567. f. 2;* Cordier, Champ. Fr. *pl. 27. f. 2;* Gillet, Champ. Fr. *pl. 164.* [*396*]; Krombh. Abbild. *pl. 1. f. 23, 24;* Lanzi, Fung. Mang. *pl. 32. f. 3, a, b, c;* Paulet & Lév. Icon. Champ. *pl. 71. f. 1–4;* Rich. & Roze, Atl. Champ. Fr. *pl. 37. f. 7–9;* Sicard, Hist. Nat. Champ. *pl. 43. f. 233.*

EXSIC.: Ellis & Everhart, N. Am. Fungi *1915;* Arcangeli, Erb. Critt. Ital. ser. 2, *807;* Herpell, Sammlung präpariter Hutpilze *132.*

DISTINGUISHING FIELD-MARKS: This species is somewhat difficult to determine from a description because of the rather wide variations it shows in different habitats. The latex more or less quickly turns to sulphur-yellow and the broken flesh has at first a pungent and characteristic odor which is an assistance in distinguishing the plant. The milk and the odor, together with the yellowish-salmon, sometimes more or less fulvous, color of the faintly zonate, slightly viscid pileus, will serve as determining characteristics for typical forms. The viscidity disappears very readily and the pileus is often absolutely dry and shining.

In shady dry woods, I have found the pileus to be rather pale, varying from whitish to pale-flesh color (*136. t. 4*) and from azonate to obscurely zonate as in my *nos. 30B*, 1906, and *2*, 1907, while in wet localities or in the open, I have found the color more yellowish-salmon or approaching fulvous, and the zones well marked. *No. 68*, 1907, which was growing in a little hollow made very wet by rain, was a striking example of this tendency. *Nos. 1012* and *1357*, herb. N. Y. Bot. Garden, collected by Earle, are intermediate forms between such pale forms as are represented by *L. brevis* Peck or *L. brevipes* Longyear, and the more distinctly zonate forms. *L. brevis* Peck seems to me to be an extreme form of *L. theiogala* (Bull.) Fr., and, although the original description gives the pileus as azonate, the type specimens show in some cases faint indications of zones. Further, the presence of tomentum on the stem base of *L. theiogala* is not constant, but may be found

in either the pale azonate or the darker zonate forms. While the size of the pale forms is usually much less than that of the darker, I have found typical forms of the species as small as the size given for *L. brevis* Peck. The stem of plants of *L. theiogala* growing in dry woods is usually firm and stuffed. Since the distinguishing characteristics given for *L. brevis* — white or whitish color, smaller size, solid or stuffed stem, and absence of tomentum from the base of the stem — are all present in *L. theiogala* under varying conditions of habitat, and intermediate forms exist between the typical *L. brevis* Peck and *L. theiogala* (Bull.) Fr., I am inclined to regard the former as a form of the latter due to ecological factors. *L. brevipes* Longyear I believe to be founded on immature specimens of a small pale form of *L. theiogala* and probably the same as *L. brevis* Peck.

The type specimens of *L. xanthogalacta* correspond to small plants of *L. theiogala*. This species was described from dried plants collected in California and the accompanying field-notes indicated that the milk was yellow, upon which character the species was based. But since the latex of *L. theiogala* often becomes yellow so quickly as to seem to be yellow from the first, and since the type specimens of *L. xanthogalacta* resemble exactly similar specimens of *L. theiogala*, I have no doubt as to their identity with the latter species.

41. LACTARIA COLORASCENS Peck, Bull. N. Y. St. Mus. **94**: 33. 1905. [As *Lactarius*]

Pileus fleshy, thin, nearly plane, becoming depressed in the center, whitish at first, becoming brownish-red with age, azonate, moist, glabrous, 2–5 cm. broad; gills whitish, becoming colored like the mature pileus, close, thin, adnate, or slightly decurrent; stem whitish, then brownish-red, equal, even, solid, 2.5–4 cm. long, 4–6 mm. thick; spores globose, echinulate, 8 μ; milk white, becoming sulphur-yellow, bitter.

HAB.: Woods. August.

DISTRIB: New York, *Peck*, *Atkinson* (Long Island).

DISTINGUISHING FIELD-MARKS: The change in color from pallid in young specimens to brownish-red in the mature plants, and the bitter white milk which becomes sulphur-yellow upon exposure to the air. Peck says that the color of the mature plants is similar to that of *L. camphorata*.

The type specimens which are in the herbarium of the N. Y. State Museum at Albany are those taken by Atkinson at Port Jefferson, L. I. The description does not indicate whether the pileus is viscid or dry in wet weather, but the relationship seems to be with *L. theiogala* (Bull.) Fr.

42. LACTARIA CHRYSORHEA Fr. Epicr. 342. 1838. [As *Lactarius.*]—Schröt. in Cohn, Krypt.-Fl. Schles. **3**: 541. 1889

Pileus fleshy, firm, rather thick, convex-umbilicate, then infundibuliform, whitish to yellowish tinged with flesh color, usually zoned with golden-yellow or pale-orange, slightly viscid when moist, glabrous, 2.5–10 cm. broad, margin involute at first and covered with a minute down, then spreading and naked; gills white then yellowish, some forking, close, adnate to slightly decurrent, thin; stem white, then colored like the pileus, sometimes with bright-colored spots, pruinose, glabrous except at the base, which is more or less villose, stuffed, then hollow, 2.5–8 cm. long, 6–15 mm. thick; flesh white, becoming yellow where injured; spores white, subglobose, minutely echinulate, 7–8 μ; milk white, becoming golden-yellow, very acrid.

HAB.: Mixed woods or groves. August and September.

DISTRIB.: New York, *Peck;* North Carolina, *Atkinson, Burlingham 100,* 1907, 1000 meters.

ILLUST.: Atkinson, Stud. Am. Fungi, *f. 122;* Cooke, Br. Fungi, *pl. 984;* Gillet, Champ. Fr. *pl. 50* [*151; 379*]; Hahn, Der Pilz-Sammler, 5. *f. 20;* Krombh. Abbild. *pl. 12. f. 7–14;* Lucand, Champ. Fr. *pl. 5.*

DISTINGUISHING FIELD-MARKS: The white to yellowish color of the plant, the indistinct zones which are made up of brighter-colored spots concentrically arranged, and the acrid milk. The zones and spots become more prominent with age and in drying, and while the zones may be nearly lacking in the fresh plant, they may be conspicuous in the dried specimen. The species is apparently closely related to *L. theiogala* Fr., from which it is readily distinguished by the brighter, yellow tones, the spotted character of the zones, the absence of odor in the fresh plant, and the acrid milk.

This species is classed by Saccardo with the *Piperati,* but it seems to me to belong rather with *Russularia* on account of its slightly viscid pileus and the changing color of the gills. If the

pileus were more decidedly viscid, its acrid milk would indicate its relationship with the *Sublimacina*.

XIII. HELVAE

Pileus dry, varying from velvety to flocculose, floccose-squamulose, or squamulose, at least at first, color bay-red to fulvous, fulvous-isabelline, and testaceous, flesh rather thin, and lax, except in one species; gills becoming darker with age, and pruinose; latex white and unchanging, acrid, or watery and subacrid to mild.

Synopsis of species

Pileus azonate.
- Latex white, very acrid.
  - Pileus red, umbonate, minutely flocculose at first, soon glabrous. 44. *L. rufa.*
  - Pileus red, not umbonate. 47. *L. rufula.*
- Latex white, acrid; pileus fulvous to isabelline, squamulose. 46. *L. alpina.*
- Latex watery, mild or subacrid, rarely white; pileus testaceous, fading to isabelline, floccose-squamulose. 43. *L. helva.*

Pileus zonate.
- Latex white, acrid; pileus brick-red to reddish-terra-cotta, velvety. 45. *L. Peckii.*

43. LACTARIA HELVA (Fr.) Fr. Epicr. 347. 1838. [As *Lactarius.*] — Schröt. in Cohn, Krypt.-Fl. Schles. **3**: 539. 1889

Agaricus helvus Fr. Syst. Myc. **1**: 72. 1821.
Lactarius aquifluus Peck, Rep. N. Y. St. Mus. **28**: 50. 1877.
Lactarius aquifluus brevissimus Peck, Rep. N. Y. St. Mus. **51**: 298. 1897.

Pileus fleshy, fragile, convex, then plane to depressed, subumbonate, testaceous to isabelline, expallent, azonate, dry, the whole surface broken up into floccose-granulose squamules, sometimes rivulose, 5–15 cm. broad, margin involute at first, then spreading; gills white, then tinted with incarnate, finally yellow, often forking, close, decurrent, 2–3 mm. broad; stem pale-testaceous, equal, pruinose, pubescent at the base, stuffed, then hollow, 5–8 cm. long, 1 cm. or more thick; spores globose, echinulate, hyaline, 6–7 μ; flesh of the same color as the pileus but paler, odor faint, sweet, persistent in drying; latex white, scanty, subacrid, more often watery and mild or subacrid. *Edible.*

HAB.: In mossy rather wet woods or marshes. "In pines, frequently degenerate in swampy places" (Fries).

DISTRIB.: New York, *Peck* (*L. aquifluus*); Massachusetts, *Morris;* Connecticut, *Hanmer 1469;* Pennsylvania, *Herbst;* re-

ported from North Carolina by Schweinitz, from Maine by Ricker, from Ontario, Canada, by Guillet.

ILLUST.: Bres. Fung. Trid. *pl. 39, 127;* Britz. Lact. *f. 30* (very poor); Cooke, Br. Fungi, *pl. 994.*

EXSIC.: Sydow, Mycotheca Marchica *2719.*

DISTINGUISHING FIELD-MARKS: The rather large size, the tawny buff-colored, dry, floccose-squamulose pileus, the usually watery milk, and the aromatic odor, which persists in drying.

Fries describes the latex as white except when the plant is growing in wet places. Romell says "The milk is watery; I have never found it white"; and Stevenson writes in British Fungi, "It occurs most frequently in marshes with watery juice." Thus far the American form has been found only with watery juice, and on this characteristic Peck has described it as a distinct species, *L. aquifluus.* He says "I have never found this plant with a white or milky juice, and therefore I am disposed to regard it not as a variety of *L. helvus*, but as a distinct species." The type specimens of *Lactarius aquifluus* agree in form and color with the *2719* Sydow, with Hennings' Berlin specimens, and with specimens sent from Stockholm by Romell. Since also the European plant occurs most frequently with watery juice, it would seem hardly possible to separate our plant as a distinct species, but *L. helva* may be considered as showing a variation in the character of the latex from white to watery, the latter being the usual form. It is probable that this difference in the latex is due to ecological conditions, but the mushroom most commonly grows in wet mossy places, and the prevailing form of the species scarcely seems to be degenerate, as Fries suspected; we probably have rather a hydrophilous plant, which in the dry condition might have more scanty white latex. The short-stemmed form I consider to be due to habitat.

44. LACTARIA RUFA (Scop.) Fr. Epicr. 347. 1838. [As *Lactarius.*] — Schröt. in Cohn, Krypt.-Fl. Schles. **3**: 539. 1889

Agaricus rufus Scop. Fl. Carn. **2**: 451. 1772.

Pileus fleshy, not very compact, rather thin, convex, umbonate, at length infundibuliform, bay-red to rufous, not fading, azonate, dry, minutely flocculose-silky, then glabrous and shining, 5–10 cm. broad, margin involute at first, whitish-downy, then glabrous; gills ochraceous, then rufous, sometimes forking, close, somewhat

decurrent, 3 mm. broad ; stem rufous, but often paler than the pileus, nearly equal, dry, glabrous, or sometimes pruinose and downy at the base, stuffed, firm, at length sometimes hollow, 5–10 cm. long, 6–10 mm. thick ; flesh pallid or tinged with pink, no odor ; spores white, subglobose to broadly elliptical, slightly echinulate, 7–8 μ ; latex white, unchanging, very acrid. *Very poisonous.*

HAB. : " Low woods and swamps " (Peck). August.

DISTRIB. : New York, *Peck ;* Michigan, *Longyear.*

ILLUST. : Cooke, Br. Fungi, *pl. 985 ;* Eng. & Prantl, Nat. Pflanzenfam. **1**** : *f. 110 A ;* Fr. Sverig. Svamp. *pl. 11 ;* Gillet, *pl. 163* [*391*]; Gauthier, Champ. *pl. 12. f. 1, 2* (poor); Hahn, Der Pilz-Sammler, ed. 2. *f. 15* (poor); Hussey, Illust. Br. Myc. **1** : *pl. 15 ;* Krombh. Abbild. *pl. 39. f. 12–15 ;* Lanzi, Fung. Mang. *pl. 52. f. 2. a, b, c* (coloring poor); Lucand, Champ. Fr. *pl. 223 ; Hypophyllum torminosum* Paulet, Icon. Champ. *pl. 22 ;* Rolland, Bull. Soc. Myc. Fr. **7** : *pl. 2. f. 3 ;* Rich. & Roze, Atl. Champ. Fr. *pl. 37. f. 16–19.*

EXSIC. : Herpell, Sammlung präpariter Hutpilze *108 ;* Karsten, Fungi Fennici *226 ;* Krieger, Fungi Saxonici *480 ;* Sydow, Mycotheca Marchica *609* and *2720.*

DISTINGUISHING FIELD-MARKS : The dark-red, dry, umbonate pileus, the whitish down on the incurved margin of the young pileus, the very acrid milk, and the large size of the plant. The pileus is only minutely flocculose at first and soon becomes glabrous and shining. The species seems to be rare in the United States. It has been reported from Vermont by Frost and from Rhode Island by Bennett.

45. **Lactaria Peckii** sp. nov.

Pileus fleshy, firm, broadly convex, becoming depressed in the center, sometimes umbonate, latericeous (*330*) to reddish-terra-cotta, (*100. t. 2*) zoned with darker tones, fading with age, dry, covered with a short tomentum somewhat like the pile on plush, at length nearly glabrous in the center and sometimes areolate, 5–15 cm. broad, margin involute for some time, then merely arched, sometimes flexuous in old plants, at first striate with darker streaks ; gills pale-buff (*64*), soon becoming tinged with mineral-brown (*339*) and reflecting buff in one light and mineral-brown in another, finally becoming madder-brown, mostly entire, close, decurrent by a tooth, 3 mm. broad ; stem dull pale reddish-

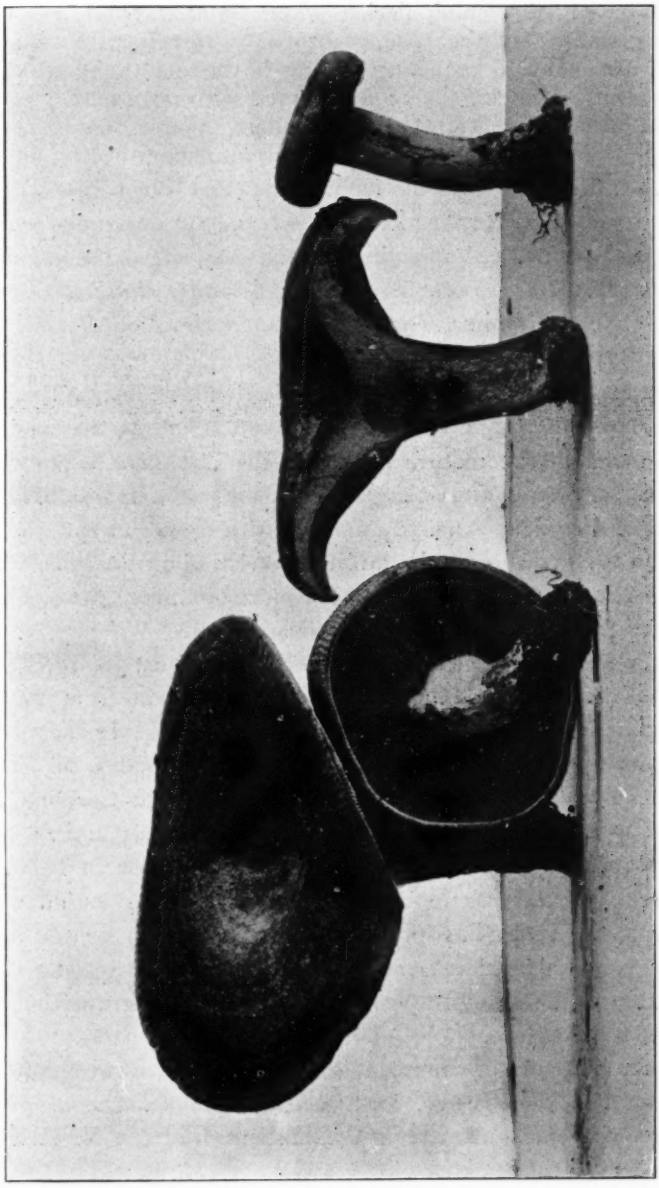

FIGURE 13. *Lactaria Peckii* Burl. *No. 1, 1907.*

terra-cotta, usually paler than the pileus, sometimes spotted with reddish-brown, becoming darker where bruised, nearly equal or abruptly smaller at the base, glabrous or merely with a whitish bloom, firm, stuffed, becoming hollow in the mature plant, up to 4.5 cm. long, 1–2 cm. thick; flesh tinted with terra-cotta; spores whitish, subglobose, strongly echinulate, 7–8 μ; latex white, unchanging, astringent, then very acrid, abundant. (FIGURE 13.)

HAB.: In moist grassy wood-trails and open places near brooks, or even in clay-banks by wood-road, in deciduous woods, oak and chestnut predominating. July, August, and September.

DISTRIB.: New York, *Peck* (Long Island), *Benedict* (Staten Island); North Carolina, 1000–1400 meters elevation, *Burlingham 1*, 1907 (type); Alabama, *Baker*.

DISTINGUISHING FIELD-MARKS: The reddish-brick-colored zonate pileus with its short coarse pile-like tomentum, the madder-brown color of the mature gills, and the abundant white milk, which is very acrid after being on the tongue a moment. The margin of the pileus is usually marked with darker furrows, possibly from the pressure of the inrolled margin upon the gills. The zones are sometimes obscure, but are more often conspicuous. In the dried plant the tomentum is inconspicuous.

A few specimens of this plant were found August 30, 1904, near Smithtown, on Long Island, by Professor Peck, who from the first was inclined to regard it as an undescribed species. In the following summer one specimen was collected by Benedict on Staten Island. But in 1907 in the "Pink Beds," North Carolina, this was the most abundant mushroom throughout July and August. It is frequently gregarious and sometimes cespitose in habit. I have seen as many as fourteen specimens growing within a few square feet. What has proved by comparison to be the same species was collected in Alabama in November, 1896, by C. F. Baker, but as it was accompanied by no field notes it was then impossible to classify it.

I take pleasure in naming this species *Peckii* in recognition of Professor Peck's extensive work upon the genus *Lactaria*.

The type specimens are in the herbarium of the N. Y. Botanical Garden.

46. LACTARIA ALPINA Peck, Ann. Rep. N. Y. St. Mus. **27**: 96. 1875. [As *Lactarius.*] Hennings, in Eng. & Prantl, Nat. Pflanzenfam. **1**[1**] : 216. 1898

Pileus fleshy, thin, convex, then plane or depressed in the center, sometimes papillate, fulvous to fulvous-isabelline, azonate, dry, minutely squamulose, especially toward the center, 1.5–4 cm. broad, margin involute, then merely arched, even; gills pallid, then yellowish and pruinose, seldom forking, close, thin, decurrent, narrow; stem of the same color as the pileus, or slightly paler, equal, dry, glabrous, stuffed, becoming hollow, 2–5 cm. long, 3–5 mm. thick; spores white, globose, echinulate, 6.5–8 μ; latex white, unchanging, acrid.

HAB.: Borders of woods. July, August, and September.

DISTRIB.: New York, *Peck, Earle 864;* Vermont, *Burlingham 106*, 1906; Maryland, *Banning;* District of Columbia, *Murrill 1491;* Virginia, 914 meters, *Murrill 17;* Alabama, *Earle.*

ILLUST.: Banning, Folio Md. Fungi (at N. Y. St. Museum, Albany), *pl. 79.*

DISTINGUISHING FIELD-MARKS: The small size, the tawny-ochraceous color, the squamulose pileus, and acrid latex. It differs from *Lactaria helva* Fr. in its small size, in the pileus being merely squamulose instead of floccose-squamulose, and in the milk never being watery. It is of about the same size and color as *Lactaria subdulcis* (Pers.) Fr.

47. LACTARIA RUFULA Peck, Bull. Torrey Club **34**: 346. 1907. [As *Lactarius*]

Pileus fleshy, firm, broadly convex, becoming somewhat infundibuliform, without an umbo, brownish-red, azonate, dry, apparently glabrous, 5–10 cm. broad; gills pinkish-yellow, becoming darker with age and pruinose, close, adnate; stem colored like the pileus but paler, equally or slightly tapering upwards, sometimes with root-like extension, often with yellowish-brown strigose hairs at the base, stuffed, 4–8 cm. long, 5–6 mm. thick; spores creamy-white, globose, verruculose, 8–10 μ; latex white, acrid.

HAB.: Rich soil and leaf-mold under trees. March.

DISTRIB.: California, *Patterson & Nohara.*

This species seems to be separated from *L. rufa* (Scop.) Fr. chiefly in the absence of an umbo, and in a cespitose habit of growth. I have not seen *L. rufa* living, but it seems to me that

L. rufula is so closely related to it as possibly to prove to be only a form. The type specimens are in the herbarium of the N. Y. State Museum at Albany, and the above description has been arranged from them and the original description.

XIV. GRISEAE

Plants rather small, varying in color from ash-gray to nearly black ; pileus dry and covered with a short tomentum or merely squamulose ; latex white, unchanging, and slowly acrid.

Synopsis of species

Pileus 2.5–5 cm. broad in mature plant, ash-gray to brownish-gray.	
Azonate, stem glabrous.	
Minutely squamulose or unpolished, aromatic.	50. *L. glyciosma.*
Minutely tomentose, no odor.	48. *L. grisea.*
Zonate, stem white-tomentulose.	51. *L. Hibbardae.*
Pileus not over 15 mm. broad in mature plant, blue-black, then zoned with slate-gray or finally with snuff-brown, scabrous-pubescent.	49. *L. Bensleyae.*

FIGURE 14. *Lactaria grisea* Peck. *No. 85*, 1907, *Burlingham.*

48. LACTARIA GRISEA Peck, Ann. Rep. N. Y. St. Mus. **23** : 119. 1873 (separate, 1872). [As *Lactarius.*] — Hennings, in Eng. & Prantl, Nat. Pflanzenfam. 1^{1}** : 216. 1898

Pileus fleshy, rather thin, firm at first, then lax, broadly convex, papillate, then depressed in the center, or at length infundibuliform, with or without papilla, varying from slate-gray (*362*) to smoke-

gray (*363*), becoming yellowish with age (putty-colored, *311*), azonate, dry, minutely tomentose, becoming floccose-tomentose, sometimes appearing squamulose to the naked eye, 1–5 cm. broad, margin involute, then spreading, entire; gills white, becoming cream-colored to honey-yellow, and pruinose, seldom forking, close, adnate to slightly decurrent, broader than the thickness of the pileus; stem of the same color as the pileus or paler, nearly equal, dry, glabrous except at the base, which is sometimes pubescent, stuffed, then hollow, 1.5–6 cm. long, 3–6 mm. thick; flesh white, unchanging, not aromatic; spores white, broadly elliptical, echinulate, 6–7 μ × 8–9.5 μ; latex white, unchanging, slowly acrid. (FIGURE 14.)

HAB.: In moist, mossy places in either coniferous or deciduous woods, on the ground or on decaying logs. July, August, and September.

DISTRIB.: New York, *Peck, Earle, Benedict, Burlingham;* Vermont, *Jones, Burt, Burlingham 2,* 1906; Maine, *White;* Connecticut, *Underwood & Earle, Benedict;* North Carolina, 1000 meters, *Burlingham 85,* 1907.

DISTINGUISHING FIELD-MARKS: The gray, tomentose, azonate, expallent pileus, the glabrous stem, and the lack of odor. While the plants may be dark-gray at first, they usually become dull-yellowish or putty-colored when mature. This species is closely related to *L. mammosa* Fr., a European plant which has not been found in the United States. As figured by Fries, *L. mammosa* is a larger, stouter plant than *L. grisea,* it does not become yellowish with age, and it has a white pubescence on the margin of the young pileus, and the stem is pubescent. *L. grisea* is at first uniformly gray and covered with gray tomentum, which later becomes floccose and less evident.

49. LACTARIA BENSLEYAE Burl. Bull. Torrey Club **34**: 87. 1907.
[As *Lactarius*]

Pileus fleshy, firm, nearly flat with margin inrolled, papillate, when older depressed in the center but the margin still recurved, blue-black when young and moist, then zoned with slate-gray (*362*), and finally with snuff-brown (*303*) toward the margin, the center remaining nearly black, dry, surface covered with a dense, minute, short, rather stiff pubescence, 2–15 mm. broad; gills whitish, some forking near the stem, close, slightly decurrent, 1 mm. wide or equal to the thickness of the pileus, stem somewhat

buff or putty-colored (*311*), covered more or less with a gray pruinosity, nearly equal, dry, glabrous, becoming hollow, 1 cm. or less in length, 2–3 mm. thick; flesh of the pileus gray, of the stem buff; spores slightly cream-colored, mostly globose, some slightly elliptical, echinulate, 5–6.5 μ, or rarely 6.5–8 μ; latex white, unchanging, acrid.

HAB.: Woods, in black moist soil, under yellow birch and spruce trees. July to September.

RANGE: Vermont, 500 meters, *Bensley, Burlingham.*

DISTINGUISHING FIELD-MARKS: The blue-black color of young or wet plants, the minute size, the hirsute-downy covering of the pileus, and the distinct zonation in the mature pileus. The species is gregarious in habit and is sometimes cespitose. As many as 35 were found in the type collection growing in an area of less than one square foot. As a rule, the stem is so short that the pileus rests upon the ground, and the plants can be detected only by careful search. Type specimens of this species are in the herbarium of the N. Y. Botanical Garden and in the herbarium of the N. Y. State Museum at Albany. They are *no. 38*, 1906.

50. LACTARIA GLYCIOSMA (Fr.) Fr. Epicr. 348. 1838. [As *Lactarius.*]—Schröt. in Cohn, Krypt.-Fl. Schles. **3**: 538. 1889

Agaricus glyciosmus Fr. Obs. Myc. **2**: 194. 1818.

Pileus fleshy, thin, convex, then expanding, umbonate, at length depressed, often without umbo, varying from dark-gray (*361*) to gray (*359*) and snuff-brown (*303*), azonate, dry, "slightly innately-squamulose, or unpolished," 2–5 cm. broad, margin involute, then spreading and striate; gills straw-colored, becoming ochraceous, close, slightly decurrent, 2 mm. broad; stem of the same color as the pileus or paler and more yellowish, nearly equal, dry, glabrous or minutely downy, stuffed, becoming hollow, 2–5 cm. long, 4–8 mm. thick; flesh white, odor strong, aromatic; spores white, globose to broadly elliptical, echinulate, 6–7 μ × 6–8 μ; latex white, unchanging, slowly acrid.

HAB.: In woods, on the ground or on decaying wood. August, September, and October.

DISTRIB.: New York, *Peck;* Vermont, *Jones;* Missouri, *Glatfelter 1203.*

ILLUST.: Britz. Lact. *f. 29* (poor); Cooke, Br. Fungi, *pl. 1011;*

Fries, Icon. *pl. 170. f. 3* (good); Krombh. Abbild. *pl. 39. f. 16–18* (poor, doubtful).

EXSIC.: Karsten, Fungi Fennici *307*; Herpell, Sammlung präparirter Hutpilze *47*.

DISTINGUISHING FIELD-MARKS: Although this is much the same color as *L. grisea*, it can readily be distinguished from it by the absence of tomentum, by the striate margin, and the pungent, aromatic odor, which persists for some time. The pileus is only faintly squamulose, and sometimes seems to be merely roughened and unpolished. It is never floccose-squamulose like the pileus in mature forms of *L. grisea*.

According to Fries, the color is sometimes brick-red and again has a violet tinge, but this has not been observed in the American forms.

51. LACTARIA HIBBARDAE Peck, Jour. Myc. **14**: 2. 1908. [As *Lactarius*]

Pileus fleshy, broadly convex or nearly plane, with or without an umbo, grayish-brown tinged with pink, darker and smoother in the center, slightly zonate, dry, minutely tomentose or pubescent, 1.5–2.7 cm. broad, margin thin, even, sometimes wavy; gills cream-colored, some forking, close, adnate, thin, narrow; stem pinkish-white, equal or slightly tapering upwards, glabrous below, whitish-tomentose at the top, stuffed, 2.5–4 cm. long, 3–6 mm. thick; flesh whitish, odor weak or none; spores globose, 6–8 μ; latex white, unchanging, acrid. (Arranged from Peck's description.)

HAB.: On the ground under pine trees. October.

DISTRIB.: Massachusetts, *Hibbard*.

DISTINGUISHING FIELD-MARKS: This species may be distinguished from *L. glyciosma*, which it most closely resembles, by the tomentose rather than squamulose pileus, the faint zonation, the absence of the odor peculiar to that plant, and by the tomentum on the stem.

The type specimens are in the herbarium of the N. Y. State Museum at Albany.

XV. PLINTHOGALAE

Pileus dry, pruinose to velvety, dark-brown, smoky-brown, or putty-colored to paler, flesh rather firm, plants of medium size; gills becoming darker with age, and pruinose; latex mild or acrid,

salmon-colored or white, either unchanging or changing to salmon-pink, at least where in contact with the broken flesh, or in one species becoming yellow.

The species in this group show as close a relationship as do those in the *Lactifluae*. Three of the species seem to be limited to America.

Synopsis of species

Latex or wounds becoming salmon-pink or reddish.	
Pileus azonate, unspotted, no odor.	
Pileus dark-brown, velvety.	54. *L. ligniota.*
Pileus snuff-brown or paler, pruinose.	52. *L. plinthogala.*
Pileus spotted, odor bad.	*L. acris.**
Latex and wounds not changing color.	
Spores yellow.	53. *L. Sumstinei.*
Spores white.	55. *L. Gerardii.*
Latex becoming yellowish.	
Pileus subtomentose.	56. *L. subtomentosa.*
Latex salmon-colored from the first, pileus whitish.	57. *L. salmonea.*

52. **Lactaria plinthogala** (Otto)

Agaricus azonites Bull. Hist. Champ. **2**: 497. 1809; Herb. Fr. *pl. 567. f. 3.* 1791. Probably not *Lactarius azonites* Gillet.

Agaricus plinthogalus Otto, Versuch Agar. 75. 1816.

Agaricus fuliginosus Fr. Syst. Myc. **1**: 73. 1821.

Lactarius fuliginosus Fr. Epicr. 348. 1838.

Lactarius fumosus Peck, Ann. Rep. N. Y. St. Mus. **24**: 74. 1872.

Lactariella azonites (Bull.) Schröt. in Cohn, Krypt.-Fl. Schles. **3**: 544. 1889.

Pileus fleshy, convex then plane, sometimes with a small umbo, depressed in the center, then subinfundibuliform, raw-umber to a dingy yellow-brown (*323, café au lait*), snuff-brown (*303. t. 4*) or putty-colored (*311*) to pallid, usually darker in the center and at first, then fading, dry, glabrous, but covered with a bloom, very smooth, sometimes slightly wrinkled in the center when mature, 2–6.5 cm. broad, margin entire or wavy; gills nearly white at first, then maize-yellow (*36. t. 4*), becoming pinkish or salmon where wounded (*74. t. 1*), pruinose, sometimes forking near the stem, sometimes connected by vein-like reticulations, subdistant, adnate or slightly decurrent, about 5 mm. broad; stem of the same color as the pileus, often whitish toward the base, nearly equal or tapering downwards, glabrous, pruinose, stuffed but firm, then hollow,

* European species, the occurrence of which in the United States is doubtful.

3–7 cm. long, 6–12 mm. thick; flesh white, changing to reddish or salmon where exposed to the air; spores yellow, mostly globular, echinulate, uniguttulate, 6.5–10 μ; latex white, rarely changing color except where in contact with the flesh, where it becomes salmon-pink, mild, then acrid.

HAB.: In deciduous or mixed woods. July to September.

DISTRIB.: New York, *Peck, Earle, Peck & Earle* (Long Island); Maine, *White;* Vermont, *Burlingham 41,* 1906; Pennsylvania, *Murrill, Herbst;* North Carolina, *Burlingham 80,* 1907. It has also been reported from Alabama by Atkinson.

ILLUST.: Atkinson, Stud. Am. Fungi, *f. 117;* Bern. Champ. Roch. *pl. 38. f. 3;* Britz. Lact. *f. 33*[a], *40;* Bull. Herb. Fr. *pl. 567. f. 3;* Cooke, Br. Fungi, *pl. 996;* Gillet, Champ. Fr. *pl. 165* [*384*]; Harzer, Pilze, *pl. 19;* Krombh. Abbild. *pl. 14. f. 10–12* (*f. 12* very poor); Noulet & Dass. Champ. *pl. 18. f. B.;* Pat. Tab. Analyt. Fung. *pl. 322.*

EXSIC.: Herpell, Sammlung präparirter Hutpilze *13.*

DISTINGUISHING FIELD-MARKS: For the most part, the pileus is snuff-brown or coffee-and-milk-colored, and is dry, glabrous or pruinose, and very smooth; the gills become yellow and the spores are yellow, while wounds of the plant become salmon-pink or reddish. The species varies greatly in size, color, closeness of the gills, and in the readiness with which the latex or wounds change color.

In the "Pink Beds," North Carolina, I found small forms growing in moss and shade, having the pileus nearly white, or stone-colored in the center, and from 3–4 cm. broad, and the gills white, close, and about 2 mm. broad, while the latex as well as the wounds became salmon-pink, but since intergrading forms occur it does not seem possible to separate it from the species. At the other extreme, in sandy soil, large normally colored forms occurred, having distant gills up to 10 mm. broad, the wounds changing slowly but the latex unchanging except where in contact with the flesh. As a rule, the paler the plant, the more quickly the wounds become salmon and the more likely the milk is to change color. The small white form described above, *no. 60,* 1907, and the distant-gilled form, *no. 69,* 1907, are in the herbarium of the N. Y. Botanical Garden.

Gillet considered *Agaricus azonites* Bull. *pl. 559* to be the type of a distinct species from *Lactaria fuliginosa* Fr. and accordingly described a *Lactarius azonites* based on that plate as the type.

53. LACTARIA SUMSTINEI Peck, Bull. Torrey Club **32**: 78. 1905. [As *Lactarius*]

Pileus fleshy, rather thin, firm, convex, soon depressed in the center, grayish to putty-colored (*311*), azonate, dry, glabrous, smooth, or with wrinkles radiating from the center, 2.5–7.5 cm. broad, margin involute, then arched or spreading; gills colored like the pileus, distant, thin, decurrent, 1 cm. or more broad; stem colored like the pileus, nearly equal, rather firm, dry, glabrous, 2.5–5 cm. long, 6–12 mm. thick; flesh whitish, not discolored with the milk; spores yellow, globular, echinulate, 7.5–10 μ; latex white, unchanging, and not staining the flesh or gills, acrid.

HAB.: "Grassy places in open woods." In deciduous woods. July and August.

DISTRIB.: Pennsylvania, *Sumstine* (type); District of Columbia, *Murrill 1476* and *1523*; Virginia, *Murrill 1682*; Missouri, *Glatfelter 1077*.

DISTINGUISHING FIELD-MARKS: The grayish or yellowish-gray color of the entire plant, the glabrous, dry pileus, and the unchanging acrid white milk. Wounds of the gills and flesh do not become pinkish or salmon as in *L. plinthogala*. It differs from *L. Gerardii* in its paler color, its yellow spores, in the gills being of the same color as the pileus, and in the acrid taste of the latex.

The type specimens are in the herbarium of the Carnegie Museum at Pittsburg, Pa., and in the herbarium of the N. Y. St. Museum at Albany.

54. LACTARIA LIGNIOTA Fr. Monogr. **2**: 177. 1863. [As *Lactarius*]

Lactarius fuliginosus majo Fr. Epicr. 348. 1838.

Lactariella ligniota Schröt. in Cohn, Krypt.-Fl. Schles. **3**: 544. 1889.

Pileus fleshy, convex, then plane to slightly depressed, umbonate, often wrinkled in the center, dark-brown, azonate, dry, pruinose velvety, 3–8 cm. broad, margin sometimes plicate; gills white to ochraceous, becoming pinkish or salmon where wounded, not crowded, of various lengths, decurrent, about 5 mm. broad; stem

of the same color as the pileus, equal or abruptly smaller and plicate at the apex, smooth, pruinose-velvety, stuffed, up to 8 cm. long and 12 mm. thick ; flesh white, becoming pinkish or salmon where wounded ; spores yellowish, globular, echinulate, 9–10 μ; latex white, changing to salmon-pink where in contact with the broken flesh, mild or finally slightly acrid.

HAB. : On the ground in mossy wet woods, especially fir. July to September.

DISTRIB. : New York, *Peck ;* Vermont, *Burlingham 43,* 1906, *Jones ;* Connecticut, *Hanmer 1945 ;* New Jersey, *Sterling ;* North Carolina, *Burlingham 20,* 1907.

ILLUST. : Atkinson, Stud. Am. Fungi, *f. 116 ;* Britz. Lact. *f. 4 ;* Fr. Icon. *pl. 171. f. 1.*

DISTINGUISHING FIELD-MARKS: This species differs from *Lactaria fuliginosa* in its darker seal-brown color, the velvety covering of the pileus and stem, the more rugose surface of the pileus, and in the larger average size of the plant.

Peck has described one "variety" under this species, *L. ligniota tenuipes,* which differs in the small size and the slender stem. This form has been found also in Connecticut by *Hanmer 1479,* and in Vermont I found one specimen, *43,* 1906, growing from an old stump in spruce woods. The form *tenuipes* may be characterized as follows :

Pileus up to 3 cm. broad, stem 2.5–8 cm. long, 4 mm. thick.

55. LACTARIA GERARDII Peck, Ann. Rep. N. Y. St. Mus. **26** : 65. 1874.* [As *Lactarius.*] — Hennings, in Eng. & Prantl, Nat. Pflanzenfam. 1^{1}** : 216. 1898

Pileus fleshy, firm, convex at first, often with a small umbo, then plane or depressed, dark seal-brown, becoming golden-brown or umber, or sometimes paler, azonate, dry, surface velvety, rugose radiately from the center, sometimes becoming cracked near the margin, margin even or wavy and irregular, often paler in color, thin, becoming extended ; gills white then cream-colored, more or less interveined, distant, appearing more so in older specimens with somewhat irregular spaces, decurrent, not very thin, broad ; stem the same color as the pileus, velvety to the touch, equal or ventricose, stuffed, then hollow, 2.5–5 cm. long, 4–20 mm. thick ; flesh white, unchanging ; spores white, globular, echinulate, 6.5–9 μ; latex white, unchanging, mild, then slightly acrid. *Edible.*

* Separate published in advance in April 1874.

HAB.: On the ground in woods or in open groves. July to September.

DISTRIB.: New York, *Gerard, Peck, Earle, Burlingham, Peck & Earle* (Long Island); Vermont, 600 meters, *Burlingham 28*, 1906; Pennsylvania, *Murrill;* District of Columbia, *Murrill;* North Carolina, 1000 meters, *Burlingham 23*, 1907.

ILLUSTR.: Ann. Rep. N. Y. St. Mus. **26**: *pl. 59. f. 12–16;* Memoir N. Y. St. Mus. **3**: *pl. 53. f. 12–16.*

DISTINGUISHING FIELD-MARKS: This species is closely related to *Lactaria ligniota* Fr., but can be distinguished from it by the white spores, the unchanging color of the broken flesh or gills, and the more distant gills.

The type specimens were collected near Poughkeepsie, N. Y., by W. R. Gerard, in whose honor the mushroom is named. They are preserved in the herbarium of the N. Y. State Museum at Albany.

56. LACTARIA SUBTOMENTOSA Berk. & Rav. Ann. and Mag. Nat. Hist. III. **4**: 11. 1859. [As *Lactarius.*] — Hennings, in Eng. & Prantl, Nat. Pflanzenfam. 1^{1**}: 216. 1898.

Pileus convex, firm, umber-brown, dry, subtomentose, 5–7.5 cm. broad; gills white, distant, decurrent, broad; stem of the same color as the pileus except at the white base, hollow, 2.5 cm. long, 12 mm. thick; latex white, becoming yellowish, acrid.

HAB.: On the ground in swamps. September.

DISTRIB.: South Carolina, *Ravenel.*

DISTINGUISHING FIELD-MARKS: The dry umber-brown, subtomentose pileus, and the acrid white latex, which becomes yellow on exposure to the air.

I have not seen the type specimens of this species, which are in the herbarium of the Royal Botanic Gardens at Kew. But the species seems to be well defined and distinct from any other of our species, and it is probable that further collections in South Carolina may discover more of these plants.

57. LACTARIA SALMONEA Peck, Bull. Torrey Club **25**: 369. 1898. [As *Lactarius*]

Pileus fleshy, rather firm, thin, convex, soon depressed in the center, otherwise nearly plane, white, becoming reddish where

bruised, dry, somewhat velvety, 2.5–3.8 cm. broad, margin involute, then spreading, even; gills pallid, becoming darker, brownish in drying, close, adnate to decurrent; stem white, salmon-colored within, nearly equal, occasionally eccentric, velvety, solid, about 2.5 cm. long, 3–6 mm. thick; flesh becoming salmon where wounded; spores subglobose, echinulate, 7.5–9 μ; latex salmon-colored.

HAB.: In wet swampy places, usually on naked ground that has been overflowed. August to October.

DISTRIB.: Alabama, *Earle* (type); Mississippi, *Earle*.

DISTINGUISHING FIELD-MARKS: The white color of the plant, the velvety covering, the short stem, and the salmon-colored latex.

This is the only known species having from the first salmon-colored milk. I have not seen this plant living and I am in doubt as to its relationship. The dry velvety pileus and the salmon color assumed by wounds would indicate a relationship with the *Plinthogalae*, while the colored milk would tend to place it with the *Dapetes*.

DOUBTFUL SPECIES

LACTARIA ACRIS (Bolt.) Fr. Epicr. 342. 1838. [As *Lactarius*.] — Hennings, in Eng. & Prantl, Nat. Pflanzenfam. 1[1]**: 216. 1898

This European species has been reported from North Carolina by Schweinitz in Syn. Fung. Carol. Super. 60. 1818, but the specimens have been destroyed by insects, and, since this is the only station for which it has been reported, I hesitate to include it in the list of species positively known in the United States. Its relationship seems to be with *Lactaria plinthogala*. The distinguishing marks are the ill odor, the spotted pileus, and the more reddish color assumed by the acrid latex. It is well figured in Cooke, Br. Fungi, *pl. 1005*.

XVI. LACTIFLUAE

Pileus dry, glabrous or velvety, some shade of fulvous, flesh rather thick and firm; gills becoming darker with age and pruinose; latex abundant, sweetish or at least mild, unchanging, but the gills and flesh sometimes becoming brown where injured.

The members of this group seem to be very closely related, the species, in one instance, differing chiefly in the reaction of the wounds upon exposure to the air. With the exception of the first two, the species are all confined to America.

Synopsis of species

Pileus entirely glabrous.	
Azonate.	58. *L. lactiflua.*
Zonate.	60. *L. ichorata.*
Pileus pruinose-velvety.	
Gills not staining brown where injured.	
Distant.	59. *L. hygrophoroides.*
Close.	63. *L. subvelutina.*
Gills staining brownish where injured.	
Pileus yellowish-buff, smooth or very slightly rugose.	62. *L. luteola.*
Pileus Vandyke-brown to dead-leaf, usually corrugated.	61. *L. corrugis.*

58. **Lactaria lactiflua** (L.)

Agaricus lactifluus L. Sp. Pl. 1172. 1753.
Agaricus oedematopus Scop. Fl. Carn. **2**: 453. 1772.
Agaricus testaceus Alb. & Schw. Consp. Fung. 209. 1805.
Agaricus volemus Fr. Syst. Myc. **1**: 69. 1821.
Lactarius volemus Fr. Epicr. 344. 1838.

Pileus fleshy, firm, convex, then nearly plane or slightly depressed, fulvous (*308*), buff (*309*), brownish-terra-cotta (*334*) to brownish-orange, sometimes much paler, azonate, dry, glabrous, smooth or at length rimose-rivulose, 5–13 cm. broad when mature; margin even, involute at first, then extended; gills creamy-white, or tinged with the same color as the pileus, becoming darker with age, changing brownish where injured, often forking 2 or 3 mm. from the stem or midway to the margin, close, adnate, 2–5 mm. broad; stem of nearly the same color as the pileus but paler, nearly equal, glabrous, pruinose, solid or sometimes becoming hollow, 2–10 cm. long, 1–2 cm. thick; flesh whitish, changing brown where exposed to the air, odor strong, persisting; spores white, globular, echinulate, 7–10 μ, cystidia 20–35 μ long, colorless or yellowish; latex white, unchanging, mild, sticky, abundant. *Edible.*

HAB.: In woods or groves, especially in the vicinity of oaks. July to October.

DISTRIB.: New York, *Peck, Earle, Burlingham 23*, 1904; Maine, *White, Murrill;* Vermont, *Jones, Burlingham;* Massachusetts, *Morris;* Connecticut, *Earle, Underwood, Hanmer;* New Jersey, *Ellis;* Pennsylvania, *Herbst;* Maryland, *Banning;* District of Columbia, *Murrill;* North Carolina, *Atkinson, Burlingham 14*, 1907, 1,000–1,400 meters elevation; Virginia, *Murrill;* Ala-

*See also "Doubtful Species."

bama, *Baker, Earle, Underwood;* Mississippi, *Earle;* Ohio, *Beardslee;* Missouri, *Glatfelter 1078;* Indiana, *G. W. Wilson.*

ILLUST.: Barla, Champ. Nice, *pl. 20. f. 1–3;* Bel. Champ. Tarn. *pl. 23;* Boyer, Champ. *pl. 31;* Bres. Fung. Mang. *pl. 66;* Britz. Lact. *f. 6;* Cooke, Br. Fungi, *pl. 999;* Cordier, Champ. Fr. *pl. 26. f. 2;* Ellrodt, *pl. 6. f. 1, 2, 3;* Fr. Sverig. Svamp. *pl. 10;* Gillet, Champ. Fr. *pl. 170* [*402*] (form); Hahn, Der Pilz-Sammler, ed. 2. *pl. 4. f. 14;* Hussey, Illust. Br. Myc. **1**: *pl. 87;* Krombh. Abbild. *pl. 39. f. 1–4* (coloring poor); Lucand, Champ. Fr. *pl. 145;* Peck, Ann. Rep. N. Y. St. Mus. **48**: *pl. 30;* Pat. Tab. Analyt. Fung. *pl. 323;* Rolland, Bull. Soc. Myc. Fr. **7**: *pl. 2. f. 1;* Roumeg. Crypt. Illust. *pl. 142;* Rich. & Roze, Atl. Champ. *pl. 38. f. 6–12* (coloring poor); Schaeff. Fung. Bav. Icon. *pl. 5;* Sicard, Hist. Nat. Champ. *pl. 44. f. 236* (poor); Venturi, Studi Micol. *pl. 6. f. 42–48;* White, Conn. Geol. and Nat. Hist. Surv. Bull. **3**: *pl. 10.*

EXSIC.: Herpell, Sammlung präparirter Hutpilze *14;* Roumeguère, Fungi Selecti Exsic. *5223;* Sydow, Mycotheca Marchica *608*; Thümen, Fungi Austriaci *812.*

DISTINGUISHING FIELD-MARKS: The rather large size and thick flesh of the plant, the glabrous, smooth, or sometimes rugose or cracked surface of the pileus, the fulvous to golden-fulvous color of both pileus and stem, the whitish gills which become brown where injured and in drying, and the abundant, mild, sticky latex. The latex drops from even slight wounds in the gills or flesh.

There is a great variation in color in different specimens of *L. lactiflua*, but the other characteristics remain so constant that it seems scarcely possible to separate valid varieties upon the color basis. Two collections from Virginia (*407* and *266* Murrill) are described as pale cream-color, while in North Carolina I found the color varying from pale-buff to a dark chestnut-red (Indian chestnut-red, *333*). This difference in color does not seem to be due to a shady or a sunny habitat. The rugose and the cracked character of the pileus, however, is probably due to weather conditions or to moisture content. In wet weather the pileus is more often rugose, while in dry weather the surface is liable to become cracked in areas. In North Carolina, while rain fell nearly every day the rugose condition prevailed, the plants with the cracked

pileus being found only later in the season when the weather was drier. Consequently, the forms having a rugose pileus I would include as merely a normal variation of the species.

Linnaeus describes *Agaricus lactifluus* "*pileo plano carneo lactescente, lamellis ruffis, stipite longo carneo.*" This is rather brief to indicate plainly the type that he was describing, but he cites Haller's "*Fungus flavo-ruffus in medio depressus, lacte non acri manans*" as synonymous with *Agaricus lactifluus.* Haller's description applies without doubt to *L. volema* Fr. He says "not rare in forests, easily recognized from its smoothness, firm flesh, sweet milk such as is rare in fungi. In shape the pileus is elegantly depressed in the center, with the margin roundly elevated. The color is everywhere rufus-flavous, butyraceous, lamellae paler. Not decaying, but becoming coriaceous. It is edible, with good taste. Ours is occasionally 4 in. in diameter." (Haller, Helv. 50. 1742.) Lamarck in Fl. Fr. **1**: 106. 1748, describes *Agaricus lactifluus* of Linnaeus in terms which show his plant to have been *L. volema* Fr., and he cites Schaeff. *pl. 5.* The gills of *L. volema* Fr. become rufous with age or in drying so that there is nothing in Linnaeus' description which disagrees with this species; and from his citation there seems to be little doubt that his plant was identical with *L. volema* Fries.

Agaricus oedematopus Scop. does not seem to differ from *L. volema* Fr. and the description by Scopoli agrees more exactly with Fries' description of *L. volema* than it does with the "variety" *oedematopus.* And from Scopoli's description I have referred *Agaricus oedematopus* to *L. lactiflua* (L.), or *L. volema* Fr.

59. LACTARIA HYGROPHOROIDES Berk. & Curt. Annals and Mag. Nat. Hist. III. **4**: 10. 1859. [As *Lactarius.*] — Hennings, in Eng. & Prantl, Nat. Pflanzenfam. **1**^{1**}: 214. 1898

Lactarius distans Peck, Ann. Rep. N. Y. St. Mus. **23**: 117. 1873. [Separate in April, 1872.]

Pileus fleshy, firm, convex, then plane, depressed in the center, sometimes becoming infundibuliform, yellowish-buff (*310*), bistre (*328*), or fulvous (*308*), azonate, dry, very minutely pruinose-velvety, appearing as though pulverulent, sometimes rugose, sometimes rimose-areolate, 4–10 cm. broad, margin involute, then spread-

ing or uplifted; gills whitish to cream-colored or yellowish-buff, not discoloring where injured, not forking, distant, sometimes connected by rugose elevations, adnate to slightly decurrent, about 3 mm. broad; stem of the same color as the pileus, nearly equal, glabrous or pruinose, stuffed or solid, 2–5 cm. long, 0.5–1.5 cm. thick; flesh whitish, no odor; spores white, globose to broadly elliptical, minutely echinulate, 8–10 μ; latex white, unchanging, not staining the gills or flesh brownish, mild, not so abundant as in *L. lactiflua* (L.). *Edible.*

HAB.: Mixed woods. July, August, and September.

DISTRIB.: Maine, *Sprague* (type collection); New York, *Peck, Underwood, Earle;* Massachusetts, *Francis;* Connecticut, *Earle 940;* Delaware, *Jackson;* District of Columbia, *Murrill 1487;* Indiana, *G. W. Wilson;* Missouri, *Glatfelter;* Mississippi, *Earle.*

ILLUST.: Peck, Mem. N. Y. St. Mus. **3**: *pl. 53. f. 7–11.*

DISTINGUISHING FIELD-MARKS: The yellowish-buff or fulvous color of the plant, the pruinose-velvety covering of the pileus, the usually short stem, the distant gills, which do not stain brown where injured or in drying, and the white, mild latex.

The type specimens of *Lactaria hygrophoroides* are in the herbarium of Harvard University and also of the Royal Botanic Gardens, Kew, England. They are *no. 6194* of Curtis's fungi. Specimens of *Lactarius distans* Peck from the herbarium of the N. Y. Botanical Garden, *no. 940*, were sent to Kew Gardens for comparison with the type specimens of *L. hygrophoroides* and were pronounced by Mr. Massee to agree with the type.

60. LACTARIA ICHORATA (Batsch) Fr. Epicr. 345. 1838. [As *Lactarius.*] — Hennings, in Eng. & Prantl, Nat. Pflanzenfam. 1^{1**}: 274. 1898

Agaricus ichoratus Batsch, Elench. Fung. 38. 1783.

Pileus fleshy, rather thin but opaque, rigid, then lax, plane to depressed in the center, fulvous, sometimes brown in the center, zoned with testaceous, dry, glabrous, smooth, 5–8 cm. broad, margin incurved, then spreading; gills white, then ochraceous, often forked toward the margin of the pileus, rather close, adnate, not very broad; stem of the same color as the pileus or more yellowish, dry, glabrous, spongy-stuffed, 5–8 cm. long, eccentric; flesh pallid, becoming sordid-fuscous when exposed to the air; spores 8–10 μ × 6–7 μ; latex white, mild or sometimes astringent.

HAB.: On ground in woods.

DISTRIB.: Ohio, *Lloyd.* Rare.

ILLUST.: Batsch, Elench. Fung. *pl. 13. f. 60. a, b;* Britz. Lact. *f. 36* (coloring poor); Cooke, Br. Fungi, *pl. 1000* (good).

DISTINGUISHING FIELD-MARKS: This specimen resembles *L. volema* but differ in being zonate and more slender. Lloyd says of the specimens which he found: "Stem solid but slightly spongy, eccentric in the few specimens I saw. Pileus brown, marked with zones. Milk white, acrid, not changing in color."

These specimens are in the herbarium of the N. Y. State Museum at Albany. In the dried condition they resemble *L. lactiflua* except for the zonation and their smaller size.

61. LACTARIA CORRUGIS Peck, Ann. Rep. N. Y. St. Mus. **32**: 31. 1880. [As *Lactarius.*] Hennings, in Eng. & Prantl, Nat. Pflanzenfam. **1**[1]**: 214. 1898

Pileus fleshy, firm, thick, convex, then depressed in the center, color varying from Vandyke-brown (*340. t. 4–1*) in the center, to mineral-brown (*339. t. 1*) at the margin, sometimes paler, approaching more nearly dead-leaf (*321. t. 1*), azonate, dry, minutely velvety, and appearing as though covered with a bloom, surface more or less corrugated, 7–12 cm. broad, margin involute at first, then arched or spreading; gills cinnamon (*323. t. 3*) when young, paler when mature or tinted with honey-yellow, becoming fulvous-brown where injured or when dried, sometimes forking, close, adnate to slightly decurrent; stem tinted with dead-leaf (*321. t. 1*), paler than the pileus, nearly equal, dry, pruinose in the upper portion, minutely pubescent at the base, firm, solid, 6–7 cm. long, 2–2.5 cm. thick; flesh white, having only a slight odor; spores white, globose, echinulate, 9–12 μ; latex white, unchanging, mild or slightly astringent, abundant. *Edible.*

HAB.: Moist woods, especially in mixed oak-chestnut-maple woods. August and September.

DISTRIB.: New York, *Peck;* Connecticut, *Webster, Underwood, Hanmer, 1936;* New Jersey, *Sterling;* Pennsylvania, *Herbst;* Delaware, *Jackson;* North Carolina, *Atkinson, Burlingham 18,* 1907 (1000 meters); Tennessee, *Murrill, 596;* Alabama, *Earle;* Mississippi, *Earle;* Missouri, *Glatfelter.*

ILLUST.: Atkinson, Stud. Am. Fungi, *f. 115.*

DISTINGUISHING FIELD-MARKS: The rather large size of the ma-

ture plants, the dark color of the pileus, which inclines more to Vandyke-brown than to fulvous, the paler stem, the velvety-pubescent covering of the pileus and the lower portion of the stem, and the more or less corrugated condition of the pileus. There is but little or no odor, and the wounds of the gills do not turn brown so quickly as in *L. lactiflua*.

The species is closely related to *L. lactiflua*. The specific name refers to the corrugated surface of the pileus, but since *L. lactiflua* occurs with a rugose pileus, the specific differences seems to me to be in the velvety-pubescent covering of *L. corrugis*, the more livid color of the plant, the absence of the strong odor which is characteristic of *L. lactiflua*, and the larger spores and cystidia. As a rule the cystidia of *L. lactiflua* are paler.

62. LACTARIA LUTEOLA Peck, Bull. Torrey Club **23**: 412. 1896. [As *Lactarius*]

Lactarius foetidus Peck, Bull. N. Y. St. Mus. **54**: 949. 1902.

Pileus fleshy, firm, broadly convex or nearly plane, somewhat depressed in the center, whitish to yellowish-buff (*310*), azonate or sometimes with a depressed zone near the margin, dry, minutely pruinose-velvety, sometimes slightly rugose, 5–8 cm. broad, margin involute at first, then arched or spreading; gills white, then yellowish, becoming brown where injured, some forking near the stem, close, adnate, or slightly decurrent, narrow; stem of the same color as the pileus, nearly equal, dry, somewhat pruinose-velvety, stuffed, 2–6.5 cm. long, 6–12 mm. thick; flesh whitish, staining brown where injured; spores white, subglobose, echinulate, 7.5–8 μ; latex white, staining the flesh and gills brown, mild, abundant.

HAB.: Mixed woods, among fallen leaves, in dry or fairly moist soil. July, August, and September.

DISTRIB.: Massachusetts, *Webster* (type specimens); New York, *Peck*, *Earle 840*; Connecticut, *Hanmer 534*; Tennessee, 518 meters, *Murrill 960*; Ohio, *Beardslee*; Missouri, *Glatfelter*; Mississippi, *Earle*.

ILLUST.: Bull. N. Y. St. Mus. **67**: *pl. 83. f. 7–11.*

DISTINGUISHING FIELD-MARKS: The whitish to yellowish-buff color of the pileus and stem, the minutely velvety covering, and the white, close narrow gills which stain brown where wounded. The latex is very abundant, and according to Peck becomes brown

upon exposure to the air. The color of the plant becomes a deeper yellow in drying. It may be distinguished from *L. lactiflua* by its smaller size, the velvety, more yellow pileus, and by the different odor. It resembles *L. hygrophoroides* more closely, but can be separated from that by the close gills, and by the brown color

63. LACTARIA SUBVELUTINA Peck, Bull. N. Y. St. Mus. 75: 10. 1904. [As *Lactarius*]

Pileus fleshy, firm, convex then nearly flat, depressed in the center, golden-fulvous, dry, minutely velvety, appearing pruinose to the naked eye, sometimes wrinkled, 2.5–5 cm. broad, margin inrolled, then spreading, even, sometimes wavy; gills cream-colored, becoming darker with age, not staining brown where injured, a few forking, close, adnate to slightly decurrent, narrow; stem of the same color as the pileus or paler, equal, somewhat velvety, smooth, solid, 1–2 cm. long, 4–8 mm. thick; flesh white, not staining brown; spores white, subglobose, nearly smooth (minutely and sparsely papillate), 6.5–8 μ; latex white, unchanging, mild.

HAB.: "Woods and open places."

DISTRIB.: New York, *Peck* (type); Ohio, *Dawson 41*; Missouri, *Glatfelter 399*.

DISTINGUISHING FIELD-MARKS: The close gills and the unchanging white latex which does not stain the gills brown.

The dried specimens of this plant closely resemble those of *L. luteola* Peck, but the spores are smaller and smoother.

DOUBTFUL SPECIES

"LACTARIUS SACCHARIUM" Johnson, Bull. Minn. Acad. Sci. **1878**: 337. 1878.

The type specimens of this species I have not seen, and, so far as is known, Johnson's material from which he made his determinations has not been preserved. Since the type is not available and

since during the thirty years following the description no further collections have been reported, I hesitate to regard it as a valid species. But in order that the species may be established if it be valid, I append the following, arranged from Johnson's description:

Pileus convex, papillate, at length expanded, depressed, then infundibuliform, brownish, or slate, pruinose, then reddish-orange,

LACTARIA CALCEOLUS Berk. Lond. Jour. Bot. 6: 315, 316. 1847.
[As *Lactarius*]

Pileus fleshy, thin, convex, with depressed center, brown-buff, dry, smooth, 7.5 cm. broad, margin repand, epidermis rimose; gills white, more or less connected by transverse veins, forked near the edge, very distant, decurrent, up to 12 mm. broad; stem of the same color as the pileus, 12 mm. thick and long; flesh white; latex white, mild.

HAB. and LOC.: On the ground in woods, Waynesville, Ohio, August 31 and September 10, 1844, *T. G. Lea.*

Berkeley says: "An extremely curious species, remarkable for its few distant gills and the contrast between them and the brown-buff stem. The pilei in all the specimens found at present are laterally confluent. It cannot be confounded with any known species."

This species has not been reported since they were collected by Mr. Lea, and the confluent pilei would indicate them to be an abnormal growth, very possibly of *L. hygrophoroides*, described by Berkeley & Curtis in 1859 from Sprague material.

XVII. CAMPHORATAE

Pileus dry, glabrous, usually smooth and polished, but sometimes becoming areolate or minutely roughened with pits, reddish-brown, fulvous, or tawny, rarely grayish, plants not large, pileus thin, flesh lax; gills becoming darker with age and pruinose; latex mild or tardily acrid, white, or thin and watery, usually unchanging.

Synopsis of species

Latex white, unchangi ng.	
Odor aromatic in drying, pileus red-brown.	64. *L. camphorata.*
Odor none.	
Pileus azonate.	
Gills not changing color when wounded.	
Fulvous to isabelline, sometimes bay-red.	66. *L. subdulcis.*
Golden-fulvous, stem orange	*L. mitissima.*†
Gills becoming greenish where wounded.	
Pileus about 3 cm. broad, umber-colored.	70. *L. parva.*
Pileus up to 7.5 cm. broad, grayish, often roughened.	71. *L. varia.*
Pileus zonate when moist, rather large.	69. *L. mutabilis.*
Latex white, becoming yellowish or staining gills yellow, pileus yellowish-buff.	68. *L. isabellina.*
Latex watery or whey-colored.	
Pileus brownish-terra-cotta, fading, areolate.	65. *L. rimosella.*
Pileus not becoming areolate.	
Margin even.	67. *L. seriflua.*
Margin crenate to sulcate, plant small.	64. *L. camphorata fragilis*

64. LACTARIA CAMPHORATA (Bull.) Fr. Epicr. 346. 1838. [As *Lactarius.*] — Schröt. in Cohn, Krypt.-Fl. Schles. 3: 535. 1889.

Agaricus camphoratus Bull. Herb. Fr. *pl. 567. f. 1.* 1791; Hist. Champ. 493. 1809.

Pileus fleshy, firm, rather thin, convex, often umbonate, at length expanded, depressed in the center, but the margin still arching, fulvous (*308*) to madder-brown (*334*), azonate, dry, glabrous, 1–4 cm. broad, margin inrolled and pruinose at first, not striate; gills whitish or flesh-colored (*67*), becoming reddish-brown, sometimes a few forking next the stem, close, adnate to slightly decurrent, rather narrow; stem of the same color as the pileus or paler, nearly equal, sometimes flexuous, glabrous, pruinose, smooth, firm to spongy, 1–3 cm. long, 3–8 mm. thick; flesh of about the color of the gills, unchanging, odor aromatic, becoming more pronounced in drying; spores white, globose, echinulate, 6–7 μ; latex white, unchanging, mild, abundant. *Edible.*

HAB.: In woods, more abundant in moist mixed woods. July to October.

DISTRIB.: New York, *Peck, Earle, Burlingham;* Massachusetts, *Davis, Morris;* Connecticut, *Earle;* Vermont, *Burlingham 10,* 1906, *Burt;* Pennsylvania, *Glatfelter;* Virginia, *Murrill;*

* See also "Doubtful Species."

† European species, the occurrence of which in the United States is doubtful.

North Carolina, *Burlingham 3*, 1907; Tennessee, *Murrill;* Alabama, *Earle.*

ILLUST.: Barla, Champ. Nice, *pl. 20. f. 11–13* (coloring poor); Bern. Champ. Roch. *pl. 38. f. 2;* Bull. Herb. Fr. *pl. 567. f. 1;* Cooke, Br. Fungi, *pl. 1013. f. a;* Hahn, Der Pilz-Sammler, *f. 12* (coloring poor); Krombh. Abbild. *pl. 39. f. 21–24;* Sicard, Hist. Nat. Champ. *pl. 43. f. 243* (poor); Venturi, Studi Micol. *pl. 13. f. 126* (poor).

DISTINGUISHING FIELD-MARKS: This species is of about the size of *Lactaria subdulcis* and sometimes of nearly the same color, but usually it is a darker-fulvous or more red-brown, and the flesh is firmer. The odor is usually faint at first but becomes strong as it dries. To me the odor is like that of slippery-elm bark. The pileus is polished in appearance and does not fade with age nor become rimulose.

The European writers describe the pileus as zonate, but no zonate specimens have been reported in the United States. In the original description, Bulliard says "*interdum sulcis zonatim exaratus,*" which would seem to indicate that the zonation was not marked by a difference in color so much as by concentric wavesor furrows.

In North Carolina I found several times in the same place and once in a different locality plants which were different in several points from the typical *L. camphorata,* but had the characteristic odor both when fresh and in drying, though slightly fainter. When dried they closely resemble small forms of *L. camphorata.* Until I have made further collections I hesitate to describe this plant as a distinct species, but it seems to me to be more than a variable form of *L. camphorata,* and hence I shall assign it the rank of subspecies under the following name and characterization:

64*a.* **Lactaria camphorata fragilis** subsp. nov.

Pileus soon depressed in the center, with or without an umbo, very thin, snuff-brown (*303*) or burnt-umber (*304*) toward the center, not fading, azonate, dry, glabrous, pruinose, sometimes rugose in the center 2.5–3.5 cm. broad, margin crenate and somewhat sulcate; gills maize-yellow (*36. t. 4*), not crowded, about five times broader than the thickness of the pileus; stem burnt-umber, stuffed, becoming hollow, 2–5 cm. long, 4–6 mm. thick; latex watery, mild, abundant. Other characters like those of *L. camphorata.*

The type specimens are in the herbarium of the N. Y. Bot. Garden and are *no. 33*, 1907.

65. LACTARIA RIMOSELLA Peck, Bull. N. Y. St. Mus. **105**: 37 1906. [As *Lactarius*]

Pileus fleshy, thin, rather firm, convex-umbonate, then depressed in the center, brownish-terra-cotta (*334*) fading to red-brown-terra-cotta (*332. t. 1*) azonate, dry, glabrous, rugose from the center, then cracking into minute areas, 3–6.5 cm. broad, margin involute then arched, even, sometimes wavy; gills whitish, then somewhat ochraceous, and finally colored like the pileus, a few forking near the stem, close, decurrent, 4–6 mm. broad; stem colored like the pileus, but not so expallent, equal or tapering upwards, pruinose at the apex, tomentose at the base, stuffed, then hollow, 2–6.5 cm. long, 5–10 mm. thick; flesh isabelline when young, colored like the pileus when old, odor faint, somewhat like that of *L. camphorata*; spores white, broadly elliptical, echinulate, $7 \times 8\,\mu$; latex watery or colored like skimmed milk, taste mild, but a little woody.

HAB.: In mixed woods under beech trees among ferns; also "on bare soil in woods or on banks of earth by roadsides" (Peck) July and August.

DISTRIB.: New York, *Peck* (type); Vermont, *Burlingham 39*, 1906.

ILLUST.: Bull. N. Y. St. Mus. **105**: *pl. 95. f. 7–11.*

DISTINGUISHING FIELD-MARKS: This species resembles *L. camphorata* in size and color, but differs in the pileus becoming rimulose-areolate, in its fading to a more pinkish-terra-cotta when mature, or in any case as soon as collected, and in the thin bluish-white or watery milk. The odor, which is very faint, does not become stronger in drying.

The type specimens are in the herbarium of the N. Y. State Museum at Albany.

66. LACTARIA SUBDULCIS (Pers.) Fr. Epicr. 345. 1838. [As *Lactarius*]

Agaricus lactifluus dulcis Bull. Herb. Fr. *pl. 224 A, B.* 1784.
Agaricus subdulcis Pers. Syn. Meth. Fung. 433, 434. 1801.
Lactarius subdulcis Fr. Epicr. 345. 1838.
Lactarius subserifluus Longyear, Rep. Mich. Acad. Sci. **1901**: 57 59. 1902.

Pileus fleshy, thin, firm, convex, papillate, becoming depressed to infundibuliform, fulvous (*308*), isabelline (*309*), or reddish-fulvous, not fading, azonate, dry, glabrous, smooth, 1.5–5 cm. broad, margin involute, then spreading, sometimes flexuous; gills whitish or tinted with isabelline, becoming pruinose, sometimes forking, close, adnate or decurrent by a tooth, up to 3 mm. broad; stem of the same color as the pileus or paler, nearly equal or tapering upwards, glabrous, or sometimes slightly pubescent at the base, dry, stuffed, becoming hollow, 2–7 cm. long, 2–6 mm. thick; flesh whitish or tinted with isabelline or fulvous, odor none; spores white, globular to broadly elliptical, echinulate, 7 × 8 μ; latex white, unchanging, mild or slowly acrid to bitterish. *Edible.*

HAB.: In the woods or on the border of woods, common. July to September.

DISTRIB.: New York, *Peck*, *Earle;* Vermont, *Jones*, *Burlingham 9*, 1906; Maine, *White*, *Murrill;* Connecticut, *Underwood;* New Jersey, *Ellis*, *Murrill & Earle;* Pennsylvania, *Murrill;* Virginia, *Murrill;* Alabama, *Underwood & Earle;* Illinois, *Glatfelter;* Ohio, *Beardslee;* Missouri, *Glatfelter;* North Carolina, *Burlingham.*

ILLUST.: Barla, Champ. Nice, *pl. 20. f. 4–10* (poor); Bern. Champ. Roch. *pl. 38. f. 1.* (bad); Bolt. Geschichte, *pl. 3;* Britz. Lact. *f. 31;* Bull. Herb. Fr. *pl. 224. f. A, B;* Cooke, Br. Fungi, *pl. 1002* (poor); Cordier, Champ. Fr. *pl. 26. f. 1* (very bad); Gillet, *pl. 171*, [*393*]; Hahn, Der Pilz-Sammler, *f. 13* (poor); Harzer, Pilze, *pl. 53* (very bad); Lanzi, Fung. Mang. *pl. 51. f. 3;* Quél. Champ. Jura, *pl. 11. f. 3* (bad); Roumeg. Crypt. Illust. *f. 141* (uncolored); Sicard, Hist. Nat. Champ. *pl. 44. f. 238;* Sowerby, Eng. Fungi, *pl. 204*, *Agaricus lactifluus* (?).

EXSIC.: Ellis & Everhart, Fungi Columbiani *1736;* Herpell, Sammlung präparirter Hutpilze *48;* Karsten, Fungi Fennici *510;* Thümen, Fungi Austriaci *913;* Sydow, Mycotheca Marchica *3320.*

DISTINGUISHING FIELD-MARKS: The fulvous or isabelline color of the pileus and stem, the rather thin but firm pileus, which is dry, glabrous, and usually smooth, the lack of odor when fresh or in drying and the mild then slightly bitterish-acrid taste of the white latex. The plants are comparatively small and slender.

There seems to be much variation in the color of the plants as well as in the form. I have found specimens which differed from the typical *L. subdulcis* only in having the margin distinctly striate,

or the surface rugose, and both of these I suspect to be common variations in the plant. Gillet describes three "varieties" of *L. subdulcis*, two of which Peck reports to have found in the United States, but I have collected only one of these, *rufa*. These two forms, which Gillet terms "varieties," he describes as follows:

Stem spongy, cap becomes more concave, of a deep live russet-chestnut, but unpolished, taste sweet. *rufa*.
Stem full, then hollow, cap russet-cinnamon, sublustrous, taste sweet, then acrid, bitter. *cinnamomea*.

Lactarius subserifluus Longyear differs from the typical *L. subdulcis* only in the more distant gills and the crenate margin, and the watery latex. It seems to me to be a depauperate form of *L. subdulcis*, due probably to ecological conditions, all of the specimens having been collected in high, open woods. Mr. Longyear states that they were growing with small forms of *L. subdulcis*.

67. LACTARIA SERIFLUA (DC.) Fr. Epicr. 345. 1838. [As *Lactarius*.] — Schröt. in Cohn, Krypt.-Fl. Schles. **3**: 534. 1889

Agaricus serifluus DC. Fl. Fr. **6**: 45. 1815.
Agaricus gynaecogalus Otto, Versuch Agar. 75. 1816.

Pileus fleshy, firm, not very thick, at first plane with the margin inrolled, then depressed with the margin elevated, brown-fawn (*307*), azonate, dry, glabrous, 5–8 cm. broad, margin sometimes flexuous; gills yellowish, close, decurrent 2–3 mm. broad; stem of the same color as the pileus, nearly equal, dry, glabrous, solid, shorter than the breadth of the pileus, 4–7 mm. thick; flesh whitish; spores whitish, subglobular, echinulate, 7–8 μ; latex semi-transparent, resembling whey, mild (acrid, *fide* DC.), scanty.

HAB.: On ground in woods, in moist and shaded places. July and August.

DISTRIB.: New York (Long Island), *Peck*. It has also been reported from Pennsylvania by Herbst.

ILLUST.: Berkl. Outl. *pl. 13. f. 4*; Britz. Lact, *f. 37* (poor); Cooke, Br. Fungi, *pl. 1012*; Krombh. Abbild. *pl. 40. f. 15, 17, 18*; Lucand, Champ. Fr. *pl. 6* (good); Peck, Bull. N. Y. St. Mus. **105**: *pl. 95. f. 7–11*.

EXSIC.: Sydow, Mycotheca Marchica *611*.

DISTINGUISHING FIELD-MARKS: The whey-colored, semi-trans-

parent latex is the prominent feature of this plant. In color it varies from brownish-fawn to cinnamon, or it may approach the color of *L. camphorata*. Peck says that our plant has a slight aromatic odor, but no mention of an odor is made by the European writers, and it may prove not to be constant in the American plant

68. LACTARIA ISABELLINA Burl. Bull. Torrey Club **34**: 88. 1907. [As *Lactarius*]

Pileus fleshy, not very thick, convex, then broadly convex, at length infundibuliform, umbonate, red-fulvous in the center, buff (*309*) toward the margin, all fading to buff when mature, azonate, dry, glabrous, somewhat roughened and wrinkled in the center

FIGURE 15. *Lactaria isabellina* Burl. *No. 38*, 1907.

especially when old, 3–4.5 cm. broad, margin glabrous, even or at length faintly striate, sometimes areolate-wrinkled; gills pale-yellowish, or tinted with the same color as the pileus, becoming reddish where bruised, forking near the stem or midway to the margin, close, thin, slightly decurrent, 3 mm. broad, or twice the thickness of the pileus; stem of the same color as the pileus, equal or slightly tapering upwards, tomentose at the base, stuffed, becoming hollow, 4 cm. long, 6 mm. thick; flesh white, staining yellowish from the milk; spores white, slightly echinulate, 6–7.5 μ × 7–8.5 μ; latex white, at length (after five minutes) becoming sulphur-yellow, or at least staining the gills and flesh yellow, astringent, then acrid, abundant. (FIGURE 15.)

HAB.: In leaf-mold or sphagnum, moist, mixed or spruce woods. August and September.

DISTRIB.: Vermont, 460 meters, *Burlingham 85*, 1906, type; North Carolina, 1500 meters, *Burlingham 38*, 1907.

DISTINGUISHING FIELD-MARKS: This species differs from *L. subdulcis*, which it most closely resembles, by the richer buff color and by the change in the color of the latex or bruised portions of the gills and flesh. The type specimens are in the herbarium of the N. Y. Botanical Garden.

69. LACTARIA MUTABILIS Peck, Ann. Rep. N. Y. St. Mus. **43**: 66. 1890. [As *Lactarius*]

Pileus fleshy, thin, convex, then nearly plane, reddish-brown, the disk and zones darker, zonate when moist, azonate when dry, moist but not viscid, glabrous, 5–10 cm. broad; gills whitish, becoming tinted with yellow in the mature plant, close, adnate, broader than the thickness of the pileus; stem of the same color as the pileus, equal or slightly tapering upwards, glabrous, stuffed, 2.5–5 cm. long, 6–10 mm. thick; flesh colored like the surface, odorless; spores subglobose, rough, 7.5 μ; latex white, unchanging, mild.

HAB.: "Low damp places." June and September.

DISTRIB.: New York, *Peck*.

ILLUST.: Peck, Ann. Rep. N. Y. St. Mus. **43**: *pl. 1. f. 1–4.*

DISTINGUISHING FIELD-MARKS: The large size, the reddish-brown color, and the zonate condition of the moist pileus. According to Peck, the zones are made up of "more or less confluent spots." The dried specimens resemble *L. subdulcis* in color, but they are much larger.

The type specimens are in the herbarium of the N. Y. State Museum at Albany. I have not seen this plant living and the above description is arranged from the original description after an examination of the type specimens.

70. LACTARIA PARVA Peck, Ann. Rep. N. Y. St. Mus. **29**: 44. 1878. [As *Lactarius.*] — Hennings, in Eng. & Prantl, Nat. Pflanzenfam. **1**^{1**}: 216. 1898

Pileus fleshy, thin, broadly convex or nearly plane, then slightly depressed in the center, sometimes with a small umbo, at first umber tinged with lilac, fading, azonate, dry, glabrous, 1.5–3 cm. broad, margin inrolled and pruinose at first, then spreading, even; gills whitish or yellowish, becoming pale dull-green where injured, and at length brownish, some forking near the stem, close, adnate to slightly decurrent, 2–4 mm. broad; stem paler than the pileus, equal or slightly tapering upwards, glabrous or merely

pruinose, stuffed, 1.5–5 cm. long, 4–10 mm. thick; flesh tinted with umber, staining pale dull-green, then brownish where injured, odorless; spores white, subglobose, slightly echinulate, 6.5–8 μ; latex white, unchanging, tardily but decidedly acrid.

HAB.: In woods on decaying wood. August and September.

DISTRIB.: New York, *Peck* (type); Vermont, *Burlingham 101*, 1906.

The plant has been collected also by Guillet in Toronto, Canada.

DISTINGUISHING FIELD-MARKS: The pale dull-green color which the wounded gills slowly assume serves to separate this species from the other members of this group with the exception of *L. varia*. It may be distinguished from the latter by its smaller size, the prevailing umber color of the pileus and stem, and the perfectly glabrous, smooth surface of the pileus. For the most part *L. parva* grows on decaying wood in moist woods, while *L. varia* grows on the ground.

The type specimens are in the herbarium of the N. Y. State Museum at Albany.

71. LACTARIA VARIA Peck, Ann. Rep. N. Y. St. Mus. **38**: 126. 1885. [As *Lactarius.*] — Hennings, in Eng. & Prantl, Nat. Pflanzenfam. **1**^{1**}: 216. 1898

Pileus fleshy, thin, convex, then plane, depressed in the center, sometimes with a small umbo, gray to brown, often with lilac tints, azonate, or rarely narrowly zonate on the margin, not viscid when moist, glabrous, sometimes minutely roughened by pits, which cause silvery reflections as though the pileus were micaceously atomate, 2.5–7.5 cm. broad; gills whitish to cream-colored, staining pale dull-greenish where wounded, close, adnate to decurrent; stem of the same color as the pileus or paler, equal, glabrous, stuffed, firm or spongy, 2.5–6 cm. long, 4–8 mm. thick; flesh white, odorless; spores white, 7–8 μ; latex white, unchanging, slowly acrid.

HAB.: On the ground in moist woods. September.

DISTRIB.: New York, *Peck* (type); Vermont, *Jones;* Massachusetts, *Davis;* New Jersey, *Sterling.*

DISTINGUISHING FIELD-MARKS: This species varies so much in color that that characteristic alone cannot serve to distinguish it, but the prevailing gray color together with the glabrous, dry,

sometimes glistening pileus, the change in the color of the wounded gills and the lack of odor will help to determine it. In color it often approaches *L. parva* Peck, but, judging from the specimens of the latter which I found in Vermont and the type specimens of *L. varia*, the two species are plainly distinct, although closely related. The type specimens of *L. varia* are a pale gray, while *L. parva* remains some shade of umber when dried. As I have not seen *L. varia* living, I have arranged the above description from the original description and some additional notes from Professor Peck and from observation of the type specimens which are in the herbarium of the New York State Museum at Albany.

DOUBTFUL SPECIES

LACTARIA ILLACHRYMANS Berk. & Rav. Berk. & Curt. Ann. and Mag. Nat. Hist. II. **12**: 425. 1853. [As *Lactarius*]

"Small; pileus thin, firm, convex to plane, then umbilicate, pale-fulvous, obscurely two- to three-zonate; stipe solid, white; lamellae white, crowded, narrow, subdecurrent, not milk-bearing when broken; taste slightly aromatic, subacrid."

HAB. and LOC.: In swamps in South Carolina, *Ravenel.*

This species has been reported also from North Carolina by Curtis. I have not seen the type specimens, but the coloration and zonation given in the above description would indicate that the species belongs to the *Lactariae*, and that the absence of milk may have been due to the age of the plant or to the fact that when the milk is scanty it will exude only immediately as a vigorous mushroom is collected. I would suspect that this number represented a form of some plant which is under favorable and normal conditions latex-bearing.

LACTARIA ALBIDA Peck, Rep. N. Y. St. Mus. **38**: 126. 1885. [As *Lactarius*]

"Pileus thin, plane or slightly depressed, glabrous, dry, white; lamellae subdistant, adnate or slightly decurrent, white, the interspaces venose; stem equal, solid, glabrous, white; spores white, .0003 to .00035 in.; milk white, taste acrid."

I have not seen this growing and the dried plant specimens do not show distinguishing characteristics. Professor Peck says in a recent letter, replying to an inquiry regarding this species, "Have

found in the Catskills a small form of what I take to be *L. albidus* Pk. The species belongs to the section *Russularia*, and I am not quite sure it is more than a white variety of *L. varius* Pk., which belongs to the *Russularia*." Further collections will undoubtedly serve to place this either as a distinct species or as a form of *Lactaria varia*.

DOUBTFUL SPECIES

Lactaria mitissima has been reported from Pennsylvania by Herbst and from California by Harkness & Moore, but the specimens from which the determinations were made have not been preserved. The description given by Herbst seems to conform very closely to *L. subdulcis*. The species is described in McIlvaine's One Thousand American Fungi, 181, and is figured in Cooke's British Fungi, *pl. 1001*. It may be distinguished from *L. subdulcis* by the more golden-fulvous color of the pileus and the orange stem, and by the more abundant latex. In Fries, Monogr. Hym. Suec. **2** : 180, the pileus is described as subviscid when moist. If this condition exists, the species should be classed with the *Quietae*.

INDEX TO SPECIES AND GROUPS

(Synonyms in Italics)

Agaricus,
aerugineus, 46
aspidaeus, 47
azonites, 84
camphoratus, 98
cilicioides, 31
circellatus, 54
deliciosus, 58
fuliginosus, 84
glyciosmus, 82
gynaecogalus, 102
helvus, 74
hysginus, 55
ichoratus, 93
Indigo, 61
insulsus, 51
intermedius, 32
lactifluus, 90
lactifluus dulcis, 100
Listeri, 18
lividorubescens, 49
Necator, 44
oedematopus, 90
pergamenus, 21
piperatus, 18, 20
plinthogalus, 84
pyrogalus, 27
quietus, 63
resimus, 33
roseo-violascens, 47
rufus, 75
rusticanus, 27
scrobiculatus, 32
serifluus, 102
subdulcis, 100
testaceus, 90
theiogalus, 69
tomentosus, 31
torminosus, 30
trivialis, 53
turpis, 44
uvidus, 49
vellereus, 22
volemus, 90
zonarius, 52
AGGLUTINATAE, 14, 40
ASPIDEAE, 14, 46
CAMPHORATAE, 14, 97
CROCEAE, 14, 37
CINEREAE, 14, 66
DELICIOSAE, 15, 57
GRISEAE, 14, 80
HELVAE, 14, 74
Hypophyllum,
lateritium, 69
INSULSAE, 14, 50
LACTARIA, 12
acris, 89
aeruginea, 46
affinis, 52
agglutinata, 41, 42
albida, 106
alpina, 79
atroviridis, 28
aspidea, 47
aspideoides, 48
Bensleyae, 81
blennia, 46
Calceolus, 97
camphorata, 98
camphorata fragilis, 99
Chelidonium, 59
chrysorhea, 73
cilicioides, 31
cinerea, 67
circellata, 54
colorascens, 72
corrugis, 94
crocea, 37, 38
deceptiva, 24
delicata, 39, 40
deliciosa, 12, 58
flexuosa, 29
Gerardii, 87
glaucescens, 25
glyciosma, 82

LACTARIA (continued)
grisea, 80
haemorrhea, 57
helva, 74
Hibbardae, 83
hygrophoroides, 92
hysgina, 55
ichorata, 93
illachrymans, 106
Indigo, 61
insulsa, 51
involuta, 26
isabellina, 103
lactiflua, 90
lanuginosa, 43
ligniota, 86
lividorubescens, 49
luteola, 95
maculata, 50
minuscula, 65
mitissima, 107
mucida, 56
mutabilis, 104
nitida, 63
oculata, 64
pallida, 66
paludinella, 66
parva, 104
Peckii, 76, 77
pergamena, 21
piperata, 12, 18
plinthogala, 5, 84
plumbea, 29
pubescens, 37
quieta, 63
regalis, 36
resima, 33
rimosella, 100
rufa, 75
rufula, 79
rusticana, 27
salmonea, 88
sanguinalis, 37
scrobiculata, 32
seriflua, 102
speciosa, 34, 35
subdulcis, 100
subinsulsa, 45
subpurpurea, 60, 61
subtomentosa, 88
subvellerea, 23
subvelutina, 96
Sumstinei, 86
theiogala, 69, 70
torminosa, 12, 30
trivialis, 53
turpis, 44
varia, 105
vellerea, 22, 24
vieta, 68
zonaria, 52
Lactariella, 5
azonites, 84
ligniota, 86
Lactariopsis, 5
Lactarius, 12
aquifluus, 74
aq. brevissimus, 74
brevipes, 69
brevis, 69
controversus, 37
deflexus, 53
distans, 92
foetidus, 95
fuliginosus, 84
fuliginosus major, 86
fumosus, 84
livescens, 49
platyphyllus, 52
pyrogalus, 27
saccharium, 96
sordidus, 44
subdulcis oculatus, 64
subserifluus, 100
uvidus, 49
villosus, 30, 31
volemus, 90
xanthogalactus, 69
LACTIFLUAE, 14, 89
PIPERATAE, 14, 18
PLINTHOGALAE, 14, 83
QUIETAE, 14, 62
RUSTICANAE, 14, 27
THEIOGALAE, 14, 69
TORMINOSAE, 14, 29
TRIVIALES, 14, 53